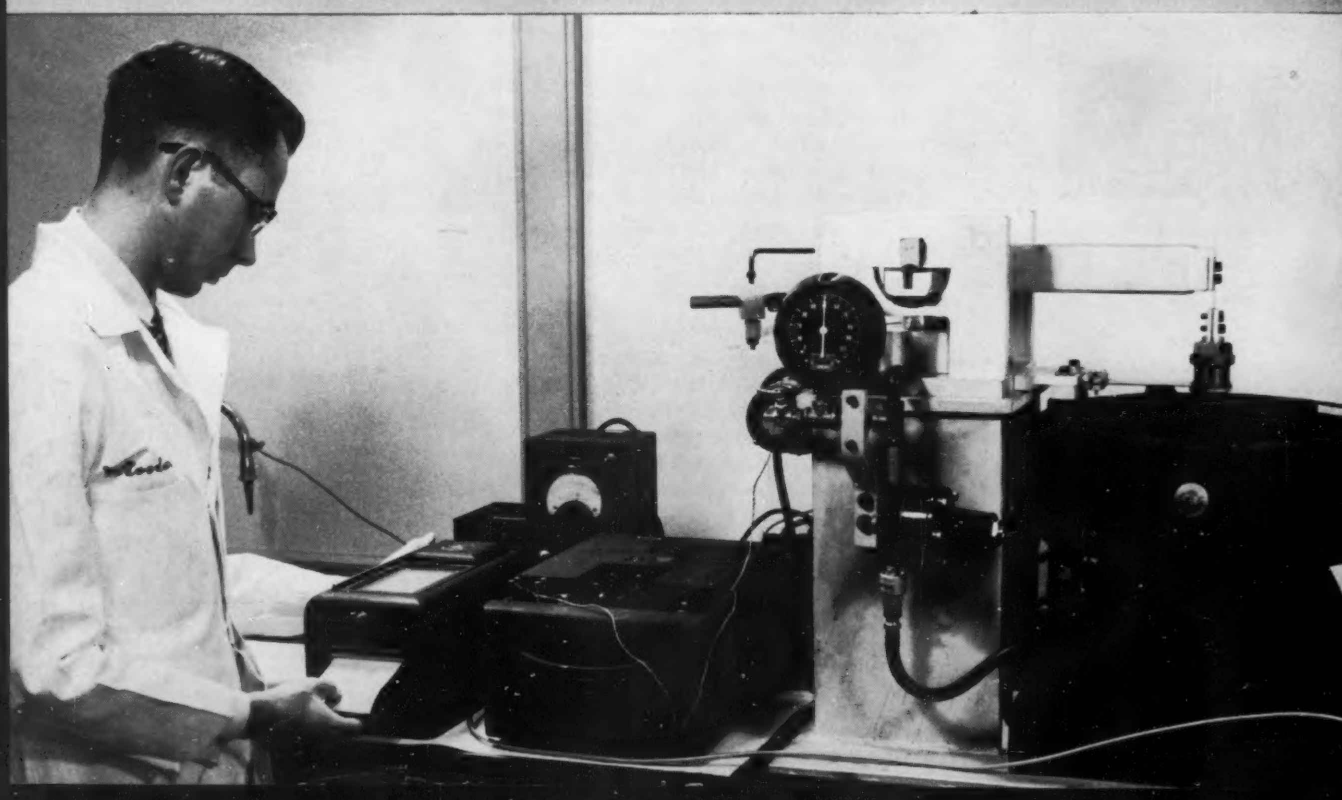
nlgi spokesman



THE PRESIDENT'S PAGE

By J. W. LANE
NLGI
President

LET'S USE OUR OPPORTUNITIES

Often our attention is fixed on the work of the Institute which is concerned with the more tangible, sometimes even dramatic operations (i. e., the proposed grease production survey or the current motion picture project) while we may tend to brush off or overlook the items not in this category. The activities of the various Technical Committee sub-committees are a case in point, demonstrated by the fact that occasionally a member company lets its Technical membership go by default by failing to appoint a representative to serve with this committee. Still, the efforts and accomplishments of the Technical Committee members are equally important with other NLGI activities, and help round out the program that we offer to industry and the public.

Members of the Technical Committee perform a most vital function for the Institute and it is around their collective efforts that much NLGI activity is based. Their far-reaching programs and accomplishments which may take literally years to materialize are the result of both inter-company and inter-industry cooperation and make for better grease lubrication engineering service. Made up of one of the outstanding groups of lubricating grease technologists in the country, this committee and its subgroups provide a medium for obtaining the views of both producer and consumer on technical questions. Some of its current programs include:

1. Formation of SAE-NLGI joint committee to explore possibilities of working on chassis-lubricant problems of mutual interest to both industries;
2. Compilation of definitions of terms peculiar to the lubricating grease industry;
3. Encouragement of scientists in research organizations within the industry to utilize NLGI as a forum for discussion of purely fundamental research projects.

This is only a partial list and, because of the very nature of the work involved, many of these projects will necessarily take some time to complete. But this careful, productive approach provides assurance that the work is complete and that results are carefully evaluated before presentation. I would like to commend these workers of the Technical Committee and to urge those member firms that have not yet appointed a Technical Representative to do so. It is to their own definite interest to do this without delay.

Only Continental offers you

Perma-Lined

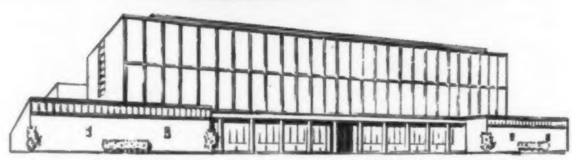
steel containers for hard-to-hold products

Your chemical, paint and petroleum products travel with greater safety in Continental's exclusive Perma-Lined steel containers. That's because specially-formulated Perma-Lining enamels are airless hot-sprayed and baked right in the formed container. Every last inch of inside surface—even side and bottom seams—gets complete uniform coverage.

In addition to product protection, Perma-Lined containers give you eye-catching lithography by Continental craftsmen. And, if you ever need research or engineering help, it's available as part of our steel container service.

Let Continental's Perma-Lined containers work for your hard-to-hold products. Call soon.

Perma-Linings available both in closed-head drums and lug cover pails



PERMA-LINED CONTAINERS TO FIT EVERY PRODUCT

Perfected by Continental's Research and Development Center in Chicago —and backed by our vast experience in all types of metal packaging— Perma-Linings are available to fit almost every chemical, paint and petroleum product. Moreover, we are prepared to develop new Perma-Linings for your special use.

CONTINENTAL CAN COMPANY

Eastern Division: 100 E. 42nd St., New York 17
Central Division: 135 So. La Salle St., Chicago 3
Pacific Division: Russ Building, San Francisco 4

2 ways to greater Grease Profits...

It makes good profit sense to use Witco Aluminum Stearates because they are specially designed for the production of greases. Seven in number, Witco Aluminum Stearates range from medium gel strength to extremely high gel. There's a "right" one for every grade of grease and every type of oil.

Take advantage, too, of Witco's expert technical service on all Witco Stearates: Aluminum, Barium, Calcium, Lead, Lithium, Lithium Hydroxy, Magnesium, Sodium.

Write for technical information and samples.

37 Years of Growth

WITCO

WITCO CHEMICAL COMPANY

122 East 42nd Street, New York 17, N. Y.

Chicago • Boston • Akron • Atlanta
Houston • Los Angeles • San Francisco
London and Manchester, England

nlgi spokesman

Volume XXI APRIL, 1957 Number 1

Published Monthly by National Lubricating Grease Institute, T W. MILLER, Editor; JOAN SWARTHOUT, Assistant Editor, 4638 J. C. Nichols Parkway, Kansas City 12, Missouri. Telephone: VAlentine 1-6771. 1 Year Subscription, $2.50. 1 Year Subscription (Foreign), $4.00.

IN THIS ISSUE

THE COVER

Malcolm C. Goodwin of General Motors Research Staff receives results from recorder of a vibration grease test machine in order to study the effect of wide vibrations on chassis greases. A standard chassis ball joint was used in the test machine, which was built so that vibrations of desired frequencies and amplitude could be imposed upon the joint. The stud is mounted in a wooden box and vibrator attached on the right. Stud is rotated back and forth by means of the steering arm. Complete description is given in "Effect of Vibration Frequency and Amplitude on Ball-Joint Grease Steering Performance" by Goodwin and coauthor N. A. Hunstad, page 10.

Photo courtesy General Motors Corporation

Effect of Vibration Frequency and Amplitude on BALL-JOINT GREASE STEERING PERFORMANCE

By M. C. Goodwin
and N. A. Hunstad
General Motors Research Staff

ABSTRACT

The design of a bench test apparatus for evaluation of chassis grease performance is described in detail. An automotive suspension ball joint is utilized in studying the effect of vibration upon the performance of chassis grease as measured by the torque required to rotate the stud of the ball joint.

Vibration frequencies and amplitudes used in the bench test work described were determined from the results of road tests. The latter studies were conducted on smooth, intermediate, and rough roads with a car instrumented to record ball-joint vibration.

Preliminary bench tests were conducted with one commercial calcium-soap grease under vibrations typical of the smooth and intermediate road tests. The increase in torque to turn the stud was greater in the tests with the "smooth-road" vibrations.

Introduction

TODAY'S COMMERCIAL CHASSIS lubricants are sometimes claimed to be inadequate for the purpose they are intended to serve. The alleged shortcomings have been examined and described on several occasions. Mr. H. R. Wolf of General Motors Research Staff discussed them at an October 26, 1954, meeting of the NLGI.[1] At that time, Mr. Wolf pointed out that chassis engineers were critical of present-day commercial chassis lubricants. They believed that a chassis lubricant should provide adequate lubrication, without noticeable change in riding qualities or steering effort, for a mileage at least double the usual recommended lubrication period.

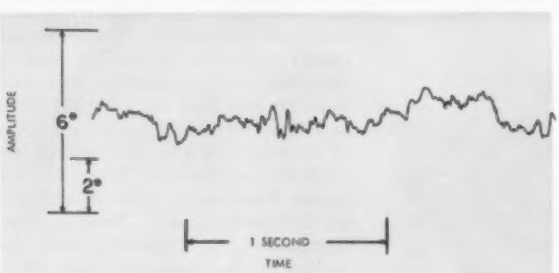


FIGURE 1—Measures ball joint vibration—smooth road.

Similar views were expressed by Mr. J. B. Beltz[2] and Mr. L. J. Kehoe[3] at the June, 1955, SAE meeting. Mr. Beltz said that an excessive increase in "ride harshness" can occur within 200 miles following grease application. According to him, "An extremely critical driver can perceive an increase in harshness within a much shorter interval." Mr. Kehoe stated that a keen observer could drive a freshly lubricated car and detect

a change in the riding and steering qualities after 10 miles of driving on a wet day or 100 miles on a dry day. An average driver, he said, could notice a change in 20 miles on a wet day and 200 on a dry day.

He then went on to discuss difficulties in evaluating grease performance. In his opinion, the worth of a lubricant cannot be measured either by how long it takes for squeak to develop in a suspension or by the static friction of the suspension.

It is evident that some method of measuring chassis grease performance that correlates with service experience is needed. After an examination of the many variables involved, it was concluded that it would be of interest to study the effect of chassis joint vibration upon grease performance.

Road Test Vibration Measurements

At the beginning of the investigation, the approximate frequency and amplitude of vibration that chassis greases are subjected to under road operation were determined. The first figure illustrates a good concrete road and an amplitude-versus-time record of the vibration of a ball-joint suspension of the car traveling along this road at 50 mph. The trace was obtained by instrumenting the ball joint and recording the vibration of the ball relative to the seat. This trace is much the same as traces obtained at car speeds of 40 and 60 mph.

The major vibration shown in this trace is associated with the sprung frequency of the car and has a frequency of 1 cycle per second (cps) and an amplitude of about 2 degrees. Another recurring vibration which was termed the intermediate vibration, has a frequency of about 10 to 15 cps and an amplitude of ½ to 1 degree. This is the vibration of the unsprung components of the front suspension. The third recurring vibration, called the minor vibration, has a frequency of about 40 to 60 cps and an amplitude of 1/20 to ½ degree. Vibrations in this range are probably due to factors such as unevenness in the tire tread, road surface irregularities, and harmonics of the sprung and unsprung vibrations.

Figure 2 shows a good gravel road. The trace recorded here was obtained while the car was traveling at 30 mph, and is similar to a trace taken at 40 mph. Again the major or sprung vibration of the car is of 1 cps frequency and 2 degrees amplitude. The intermediate or unsprung vibration is very pronounced. It has a frequency of 8 to 15 cps and an amplitude of 1½ to 2¼ degrees. The minor vibration has a frequency of 35 to 60 cps and an amplitude of 1/10 to ¾ of a degree.

Figure 3 shows a broken-up road and the corresponding vibration record made at 30 mph. It was not possible to analyze this record completely because the

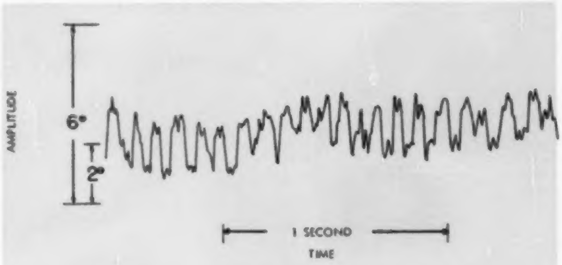


FIGURE 2—Ball joint vibration on an intermediate road.

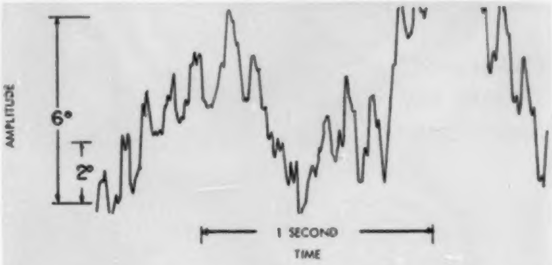


FIGURE 3—Ball joint vibration measured—rough road.

peaks were often beyond the limits of the oscillograph record. However, it is evident that the major vibration frequency is again 1 cps, but the amplitude is 6 degrees and greater. The intermediate vibration has a frequency of 10 to 15 cps and an amplitude of 2 to 3 degrees. The minor vibration has a frequency of 30 to 40 cps and an amplitude of ¼ to 1 degree.

A summary of the data in the preceding three figures is given in Figure 4. As shown in this table, the frequencies range from 1 to 60 cps and amplitudes from 1/20 of a degree to more than 6 degrees.

BALL JOINT VIBRATION DATA

		Vibration—Frequency and Amplitude		
Type of Road	*M.P.H.*	*Major*	*Intermediate*	*Minor*
Smooth	50	1 cps 2°	10-15 cps ½-1°	40-60 cps 1/20-½
Intermediate	30	1 cps 2°	8-15 cps 1½-2¼°	35-60 cps 1/10-¾
Rough	30	1 cps 6° +	10-15 cps 2-3°	30-40 cps ¼-1°

FIGURE 4—A summary of ball joint vibration data shows chassis grease is subjected to wide range of vibration.

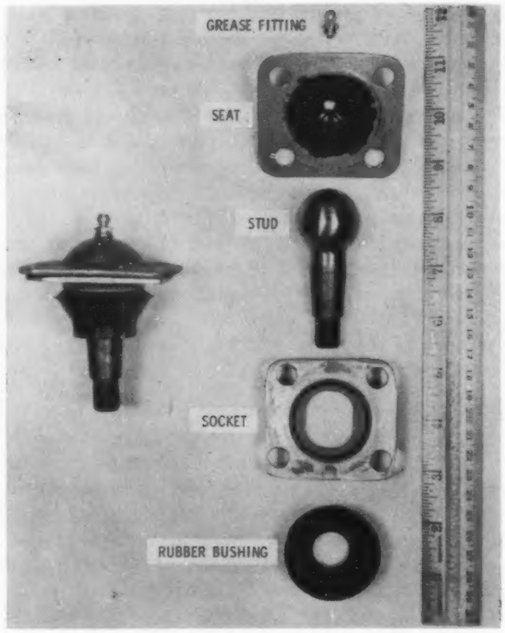


FIGURE 5—Shows two 1956 Chevrolet ball joints as used in test machine, the left assembled, the right dismantled.

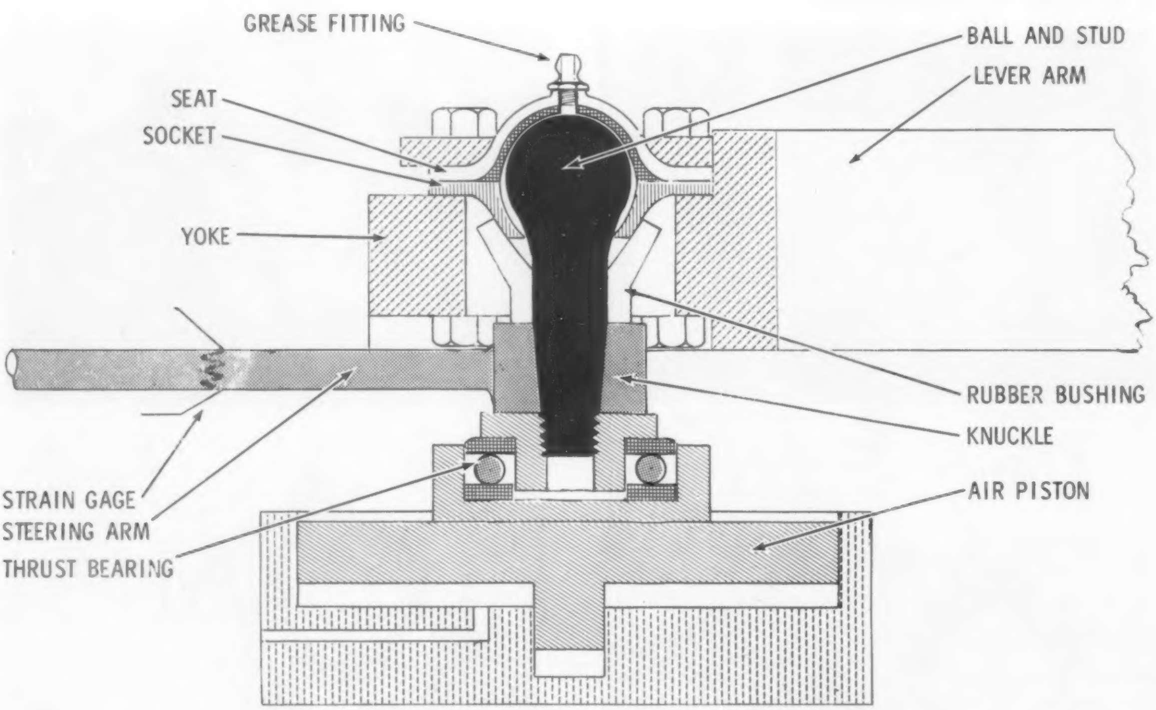


FIGURE 6—The joint as used in the grease test machine. Load is applied to stud by air piston, forcing ball up.

Bench Test Apparatus

The table emphasizes the fact that a chassis grease is subjected to a wide range of vibration. In order to study the effect of a portion of this range on greases, a bench test apparatus was built with which vibrations of desired frequencies and amplitudes could be imposed upon a greased joint. In the preliminary design, such possibly important variables as temperature, effect of water, shock loading, and so forth were excluded.

A standard chassis ball joint was used in the test machine because it is widely used in the automobile industry and could be readily incorporated in a simple apparatus. In Figure 5 are shown two 1956 Chevrolet ball joints, such as used in the test machine, one assembled and one dismantled. The joint consists of a grease fitting, seat, steel ball with its integral stud, socket, and a rubber bushing.

In a car, the seat and socket are attached to the lower control arm. The stud is connected to the car wheel. When the car wheel moves up and down, the bottom end of the stud moves back and forth laterally relative to the seat. One degree of this lateral motion is equivalent to 0.042 inch movement of the end of the stud away from its center line. In addition to moving in this manner, the stud also rotates about its axis as the car is steered.

The joint as used in the grease test machine is shown in Figure 6. Load is applied to the stud by an air piston which forces the ball upward against the seat, much like the wheel in a car forces the ball upward. The seat and socket are attached to a yoke, which is held in the frame by knife-edge bearings not shown in this figure. A lever arm is attached from the yoke to an electromagnetic vibrator, which vibrates the seat and socket about the ball.

A steering arm fastened to the knuckle is used to rotate the ball and stud back and forth around the axis of the stud, just as in the steering of a car. A strain gage is attached to this steering arm to provide a means of measuring the steering torque. Measurements can be made while the seat and socket unit is being vibrated or while it is stationary. A ball thrust bearing is placed between the stud and the air piston so that the stud can be rotated easily. Therefore, the observed steering effort value corresponds to the contribution of the ball joint to the total steering effort in a car, assuming the thrust bearing friction to be negligible.

The complete test machine is shown in Figure 7. The parts pointed out in Figure 6 are located in the center of this figure.

The electromagnetic vibrator and associated controls are on the right. The vibrator presently used

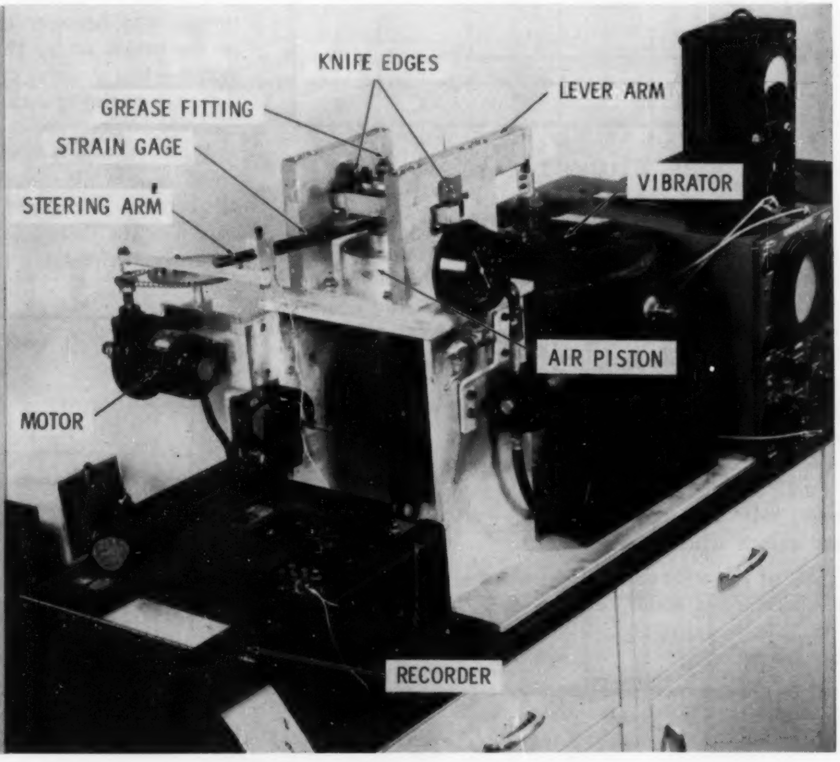


FIGURE 7 — Complete test machine. Parts named in figure 6 are located in center here. Vibrator on right.

can vibrate the seat and socket in the minor range and part of the intermediate range of vibration as found in the road tests, but is not able to impose the major vibrations.

The stud is rotated back and forth (1 cycle per 9 seconds) by means of the steering arm and the motor-driven gear and connecting rod arrangement. The output of the strain gage on the steering arm indicates the torque required to turn the stud. The strain gage analyzer and recorder shown on the left in Figure 7 provide a permanent record of the results.

Test Procedure

The tests are run as follows. A ball joint, which has been cleaned of all grease with naphtha, is mounted on the yoke. A measured amount of grease (about 2.0 g in these tests) is applied through the fitting with

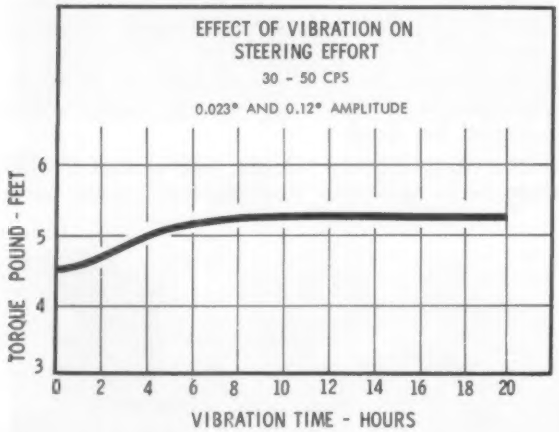


FIGURE 8—Results for eleven 20 hour tests are plotted.

a small gun, and the stud is rotated back and forth several times to assure even distribution of the grease. Air pressure is then applied, forcing the stud against the seat (1000 lbs. force in these tests). Next, vibration is begun at the desired frequency and amplitude. At this time, the first measurement of the steering torque is made by rotating the stud back and forth with the motor-driven steering arm. Additional measurements are made at one-hour intervals during the first half of a 20-hour test run and at longer intervals during the latter half. The steering arm and stud remain stationary except when steering measurements are made.

All of the tests reported here were run at a grease temperature of about 74°F.

Test Results

A single commercial calcium base grease was used in all the tests. This grease contains 4-6% calcium soap, has an oil viscosity of 275-325 SUS at 100°F, and a worked penetration of 355-385, making it of the NLGI 0 grade.

In tests conducted with this grease, both increases and decreases of steering torque after 20 hours of vibration have been observed.

In the vibration range of 30-50 cps and 0.023 and 0.12 degrees there has generally been an increase in torque. This is illustrated in Figure 8 where the average results for eleven 20-hour tests are plotted.

The value of 4.5 lb. ft. for the torque measurement at zero hours is characteristic for a freshly lubricated joint. The torque curve rises from this initial value and becomes horizontal, or nearly so, by the time of 20 hours of vibration. Tests run as long as 36 and 75 hours showed no further significant change. In other words, no appreciable increase of steering torque was noted after the initial rise in the 0 to 10-hour range. Therefore, this difference in steering effort between the 0 and 20-hour measurements was chosen as the criterion for comparing the effect of vibrations of different frequencies and amplitudes upon the test grease.

The observed early rise in torque appears to be in agreement with the observation of suspension engineers that the steering and handling qualities of a freshly lubricated car change within the first 100 to 200 miles of driving.

The question arose as to whether the increase in torque was brought about by continuous vibration of the grease or by the intermittent working of the grease when steering effort measurements were made. To answer this question, a test was run in the same manner as previously described except that the seat and socket was not vibrated. Torque measurements were made while operating the steering arm as in the other tests. The curve obtained in this single test is shown as the dashed line in Figure 9 on which is superimposed the curve from Figure 8. The increase of

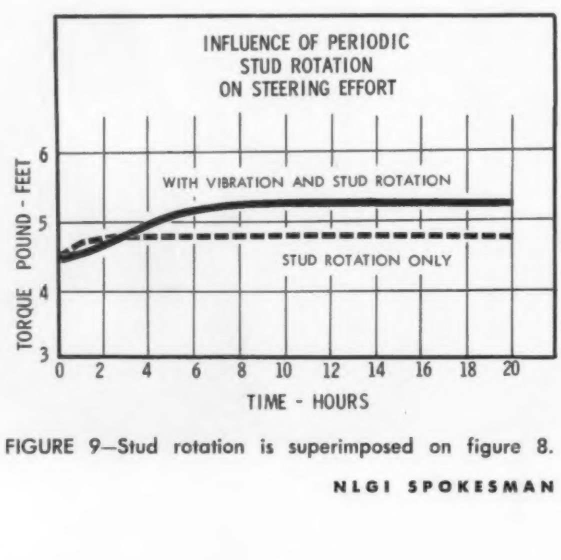


FIGURE 9—Stud rotation is superimposed on figure 8.

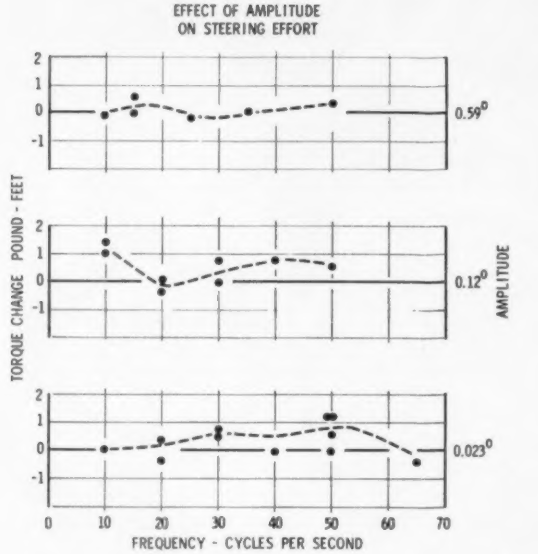


FIGURE 10—Compares results of tests made at three amplitudes of vibration—0.023, 0.12 and 0.59 degree and at frequencies from 0 to 65 cps. Note torque change.

FIGURE 11—What causes the frequent rises in torque? Chart shows results of tests made in attempt to answer.

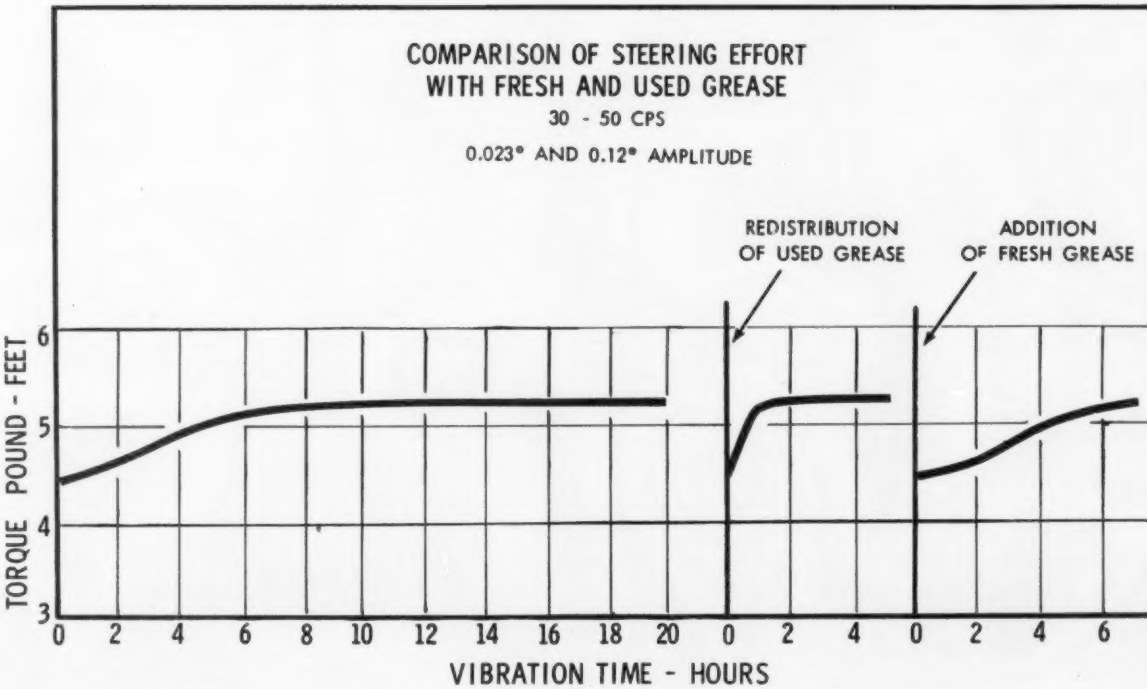
torque in the test with periodic stud rotation only was 0.2 lb. ft. This increase corresponds to about 31% of the rise observed with both vibration and periodic stud rotation. On the basis of this test, the total observed rise in torque when the joint is vibrated is considered to be due mainly to the vibration imposed.

A series of tests was conducted, within the limits of the vibration equipment, in an effort to determine the effect of the different vibrations found in the road tests. Figure 10 compares the results of tests made at three different amplitudes of vibration, namely, 0.023, 0.12, and 0.59 degree and at frequencies from 0 to 65 cps. In this figure, the torque change in each 20-hour test is plotted against frequency.

A majority of the points show an increase of torque for tests that were run with 0.023 and 0.12 degree amplitudes of vibration. There was little change in torque for the tests conducted at 0.59 degree amplitude.

The question at this point is: What causes the frequently observed rises in toque? Figure 11 shows the results of several tests made in an attempt to answer this question.

The curve on the left again represents the average of many 20-hour tests. At the end of several of these tests, the worked grease was spread about the surface of the ball and seat by hand to assure an ample amount



of grease between the rubbing surfaces. Torque readings taken after this was done are shown by the middle curve, which shows an almost immediate rise to the original plateau. Then, after a period of vibration, fresh grease was applied to the system without removal of the used grease. The curve at the right shows a rise similar to that of the curve on the left which was obtained when only fresh grease was used.

The difference between these curves suggests that the vibration caused a physical change in the grease structure, possible damage to the soap fibers or separation of the oil from the soap. However, electron micrographs of fresh and worked samples of the grease showed no physical damage to the soap fibers. It is possible that the sampling technique and the preparation of the grease sample for the electron micrograph did not give a true indication of the condition of the soap fibers located between the working surfaces during the test.

No oil separation was observed in any of the tests, even in those in which an increase of torque was recorded. Also, observations following the tests showed that there was still an ample amount of grease present in the joint.

The cause of the rise in torque has not yet been determined.

Conclusion

A grease test device has been developed which subjects grease to vibration in a ball joint. The results with one grease often show an increase of torque during vibration at small amplitudes. Within the limited range of conditions studied, some of the test results appear to correlate with the deterioration in ride and handling qualities observed by chassis engineers. It is planned that further studies will be carried out to determine the effect of broader ranges of frequencies and amplitudes, base oil viscosity, thickening agents, additives, ball and seat materials, surface conditions, and other variables.

Acknowledgment

The authors acknowledge the assistance of Messrs. J. L. Harned, A. T. Maser, and L. Ostrander of the research staff instrument section in devising, installing, and operating the equipment used in obtaining the road test vibration traces. Thanks are also due Messrs. W. L. Grube and S. R. Rouze of the research staff physics and instrumentation department for the electron microscope studies of fresh and worked grease. Finally, the helpful criticism of the Research Staff Fuels and Lubricants Department members is appreciated.

Bibliography

1. "What's Wrong in Car Greasing Today?" *National Petroleum News,* vol. 47, No. 1, pp. 89-90, 1955.
2. Beltz, J. B., "Chassis Grease Retention Tests," SAE Golden Anniversary Summer Meeting, Atlantic City, N. J., June 12-17, 1955.
3. Kehoe, L. J., "A Critical Look at Chassis Lubricants," SAE Golden Anniversary Summer Meeting, Atlantic City, N. J., June 12-17, 1955.

About the Authors

MALCOLM C. GOODWIN *began work in the Fuels and Lubricants Department of General Motors Research Staff in 1955 and is presently engaged in a general fundamental study of chassis grease performance in ball-joint suspensions. Goodwin attended Albion College and was graduated with a B. A. degree in 1953 and a B. S. degree in physical chemistry from Michigan State University in 1955.*

NORMAN A. HUNSTAD *is assistant department head of the Fuels and Lubricants Department, Research Staff, General Motors Corporation. He studied at Iowa State University prior to his army service in machine records units of the Adjutant General's Department from 1943 to 1946, and obtained his B. S. degree in mechanical engineering in 1949 from Iowa. Hunstad joined General Motors Research Staff following graduation where his work has been concerned primarily with lubricants.*

JAPAN'S GREASE INDUSTRY

. . . Today and Tomorrow

By HORTON CONNELL, Petroleum Specialties, Inc.

THE FIRST FEW minutes of the first-time visitor to Japan may evoke the impression of complete and utter strangeness—of everything being different. Particularly is this so as his taxi takes him from Haneda International airport, or, perhaps, from a pier in Yokohama, to downtown Tokyo. Strange signs, strange faces, strange sounds. Traffic—ceaseless, kaleidoscopic, rapid, noisy—and keeping to the left, instead of to the right. Even to a travel-hardened member of the petroleum world, the impression is one of strangeness.

But this impression does not linger. There is the sudden realization that the ever-present symbol of the mechanical age—the motor car—is just as important and just as much a part of daily life in Japan as it is elsewhere. And . . . where there is automotive equipment, there must be . . . petroleum . . . motor fuels . . . lubricants.

Then, all at once, nothing seems strange; the visitor feels very much at home—at home in a world linked together with the strands of petroleum and all of its myriad elements and usages.

One of these elements, of course, is that to which the efforts of this publication are directed . . . the grease industry. And in Japan, the grease industry is basically and statistically just as important as are the grease industries in all other lands.

The year 1950 might well be termed a renaissance year—the year of rebirth—of the Japanese grease industry. Because, it was not until that year that the damages and production restrictions of the previous decade began to be set aside. And it was in that year in which Japan's petroleum-hungry economy began to be fed, to a substantial extent, by the products of its own refineries—and of course, of its grease manufacturers.

Let us take a look at some of the production figures, at what types of greases are being produced and at their components—at the industry in general, and at one of the leading manufacturers in particular. This, it is hoped, will provide some general information of more than passing interest as to what is going on in other parts of the world . . . on what our neighbors are doing in this very interesting field.

I. Production

A. As mentioned, 1950 is a reliable starting point, or basing year, for comparison purposes, in measuring the progress which has been accomplished in grease production in Japan. This progress—this growth in grease output—is ably evidenced by the following production figures:

Year	*Production in pounds*	*Per cent increase over 1950*
1950	21,707,196	....
1951	33,106,284	52.50
1952	32,101,260	47.88
1953	41,322,796	90.36
1954	43,894,864	102.20
1955	45,726,077	110.65
1956	51,235,541	136.03

B. The relative percentages of individual types of greases being produced are approximately the following:

Calcium greases	53.0%
Soda greases	7.4%
Aluminum greases	6.0%
Lithium greases	0.1%
Asphaltic compounds	33.5%

This latter grade included gear compounds and extreme pressure gear lubricants, special steel mill greases, etc.

C. To the greatest extent possible, raw materials are being obtained from domestic (Japanese) sources. The mineral oil components—largely spindle oils of the naphthenic type, together with some heavier viscosity red and pale oils—all originate with domestic refineries.

Aluminum stearate, calcium, graphite, lead, and soda, are of Japanese origin. Beef tallow is imported, primarily from the United States, lithium hydroxide from the United States and from Germany, and whale oil (used to a limited extent) is processed in Japan.

All new containers are produced in Japan. Good use is made of reconditioned drums in which certain petroleum products—bright stocks and steam cylinder oils—may have been received from overseas; nearly every refinery and grease plant maintains drum reconditioning facilities.

D. The methods employed for production have changed very little during the past five years. However, there is gradual alignment under way with the manufacturing practices being developed in other countries. At present most of the production is of the open kettle type, deaeration is accomplished by various methods. Chilling or cooling is of the pan type, and milling machines are available in but a few plants.

The use of dyes, partly to improve the color of the finished grades, and partly in keeping with the tradition developed by early marketers whose imported stocks were of different colors for grade identification purposes, is quite general. Yellow, red, and orange are the popular colors.

The introduction of additives in greases has proceeded less rapidly in Japan than in certain other countries. There is no domestic additive production, and in view of the overriding policy of conserving foreign exchange to the utmost, additive imports have been held to minimum levels. The one type of additive in general use in greases manufactured in Japan—and it, too, is available from domestic sources—is lead soap, which is used primarily in the manufacture of extreme pressure lubricants.

There is reason to believe, however, that a more general use of additives will be made, but this probably will come only as the result of an educational program on the part of the grease manufacturers, in making the users of their products more keenly aware of certain advantages of additives for critical applications.

II. Marketing

A. In the past, there existed an organization composed of Japan's grease manufacturers. However, it functioned more along the lines of a cartel, with perhaps, greater emphasis on market quotas than on improvement of product. Now, a progressive organization is in existence—known as the Japan Grease Institute—the JGI—which is modeled somewhat along the lines of the National Lubricating Grease Institute of the United States.

Some standardization of trade, production, and identification practices have resulted from this organization's efforts. For example, there has been a general adoption, in the industry, of the NLGI penetration ranges for grade differentiation, and such usage is increasing. There is slightly less standardization or continuous calibration of laboratory equipment used for control purposes than might be expected, but a large measure of uniformity in quality control exists. New testing equipment is being added almost constantly to the laboratories of the various grease manufacturers. Testing standards are those of the Japan Engineering Society (JES), which have their counterparts, with ASTM testing methods.

B. There are approximately 23 grease manufacturers in Japan. Of these, five are affiliated with the major petroleum refiners (of Japan) and the remainder are independents. The "Big Three" of Japan are, in the order named and on the basis of their 1955 production records, the following:

Showa Oil Co., Ltd. (affiliated with the Shell group).

Kyodo Yushi Co., Ltd (a completely independent firm of whom more will be written later in this article).

Maruzen Oil Co., Ltd. (an independent refiner, but who works closely with Union Oil Co. of California).

These three produced some 43% of the total grease manufactured in Japan in 1955.

About the Author

H. R. Connell *is vice president of Petroleum Specialties, Inc., New York. He began work in the petroleum business in* 1928 *with Colonial Beacon Oil company and joined the Shell group in* 1932, *spending eight years in the domestic and eight years in the export sections. In* 1951 *Connell organized his own firm, Constellation Petroleum Corporation and dissolved it in* 1954 *to take his present position with Petroleum Specialties. Connell's trip to Japan in* 1956 *to prepare this article was his second trip. Connell is strongly interested in international petroleum developments.*

C. Japan's grease manufacturers usually engage in marketing their output under their own brands—either through their own sales personnel, or in combination with agents and distributors. Additionally, some of the larger independent manufacturers are suppliers to the trade—particularly that of some of the larger major petroleum marketers of Japan. Meanwhile, though, they maintain an active sales distribution of their own brands.

D. As to types of containers, the greatest demand is for 35-pound pails, usually filled to 15 kilos in accordance with commercial practices prevailing in Japan. There is considerable demand for packing in two and five pound tins, and a considerably smaller demand in one pound tins. On the part of the larger industrial users, there is a substantial demand for packing in 400 pound drums.

III. Kyodo Yushi Co., Ltd.

While the foregoing portion of this article has dealt with the grease industry in general, as it exists in Japan today, it is of some interest to consider the activities—and expansion plans, of an individual Japanese grease company which is indicative of the over-all pattern of the industry. For that reason, the invitation to visit the plant of Kyodo Yushi Co., Ltd., during the latter part of August, 1956, was welcomed.

Located near the Tsujidi station, in the outskirts of Yokohama, and thus, ideally situated to serve that adjacent, highly-industrialized area—as well as having access to export possibilities at a later date—Kyodo Yushi have their expansion plans translated into reality. At the time of the visit, much new equipment was in process of installation, with completion being scheduled for the end of the current year.

The immediate production goal is set for some 20,000 pounds each eight-hour day, of soap-type greases. It is interesting to observe, too, that included in this production will be a much higher percentage of all-purpose lithium greases than is shown in the national average. Following is the proposed manufacturing schedule, expressed percentage-wise:

Calcium greases	46.0%
Soda greases	6.5%
Aluminum greases	1.0%
Lithium greases	7.5%
Other types	39.0%

A

B

C

D

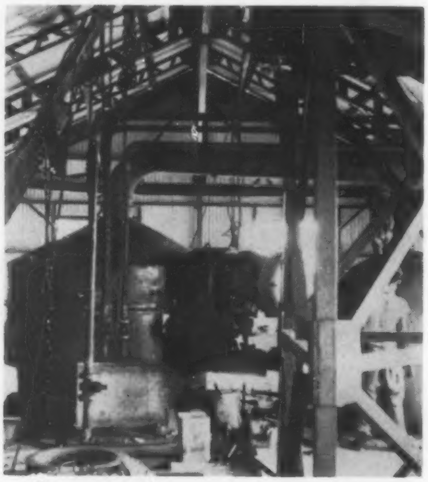
A—"ENTERING the plant of Kyodo Yushi we went to the office for a discussion of present production methods."

B—"BLUEPRINT of plant and proposed additions was explained by Mr. Tashio Hasegawa, director of operations."

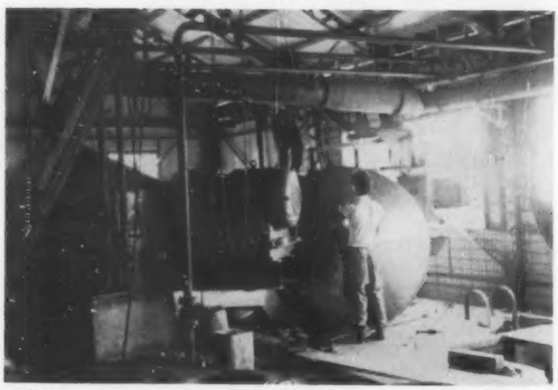
C—"THEN followed the inspection of plant No. One."

D—"INTERIOR is some 700 square meters of floor space."

E



F



G

E—VIEW of the two story extension of plant No. One.

F and G—NEW blending kettles are being installed.

H—"ONE-LUBE, their own all purpose lithium product."

I—LABORATORY will occupy second floor of the new building, will be Japan's most modern grease laboratory.

Entering through the gate nearest to the railroad, we went, first of all, to the office (A) for a discussion of present production methods, manufacturing and supply problems, output figures, and expansion plans. The blueprint of the plant and proposed additions was explained to us (B) in detail by Mr. Tashio Hasegawa, director in charge of operations, and Mr. Teruo Okuda, business manager of Kyodo Yushi.

Then followed the inspection of the plant itself. The largest structure, called Plant No. One (C—outside, D, interior), and comprising some 700 square meters of floor space, is being supplemented with an extension (E) two stories in height, which will house the new blending kettles (F, G) now being installed. Plant No. Two, of 400 square meters, contains much of the equipment for specialized grades of grease, and Plant No. Three, of 160 square meters, is the site of the cutting oil manufacturing and testing equipment. Kyodo Yushi produce cutting oils, in addition to greases, and are constantly engaged in testing, on actual shop-

H

I

type equipment, and on metals, the cutting oils which they manufacture.

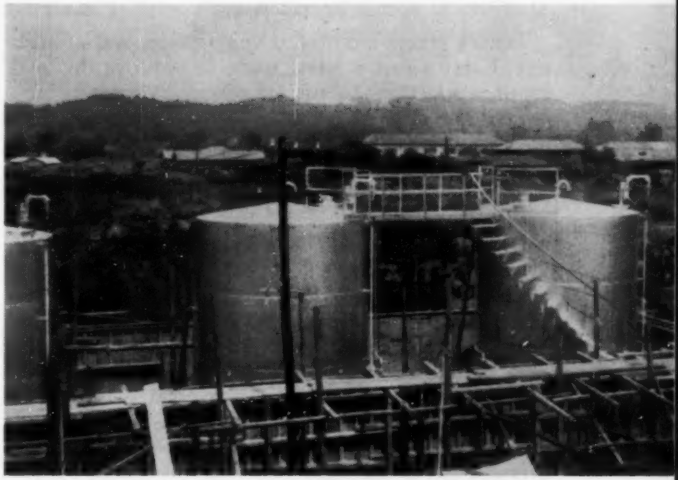
Warehouses numbers one, two, and three with a total of 450 square meters of floor space are stocked largely with containers—filled and empty—not only of Kyodo Yushi's own brands—such as "One-Lube" (their all purpose lithium product) (H) but with the containers of the various major marketers for whom Kyodo Yushi manufacture under those marketers' brands.

The present laboratory, of 100 square meters of floor space, (I) will occupy the second floor of the new 500 square meter office building when the latter is completed. This will be the most modern, up-to-date grease testing laboratory in Japan.

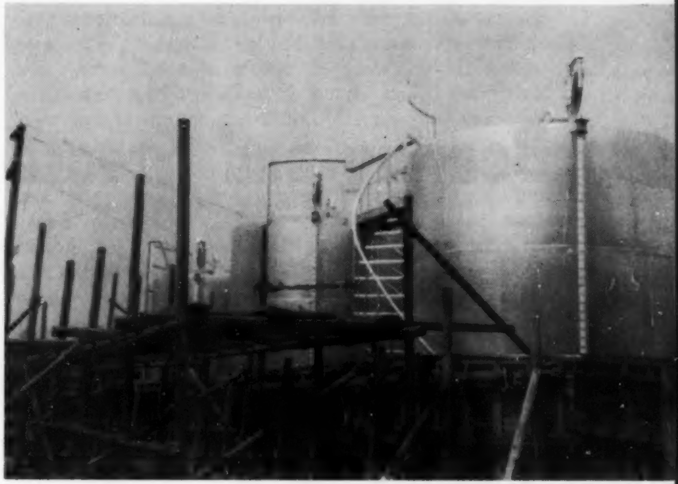
New tankage, for the storage of lubricating oil components required for grease manufacture is being erected (J and K). These will be of approximately 2000, 3000 and 4000 barrel capacity, respectively.

The tour of inspection finally brought us to that which is completely unknown in industrial installations of our western world—but which is a feature of nearly all Japanese plants—a religious center. At the Kyodo Yushi plant, this was, of course, a Shinto shrine (L and M). Erected and maintained by management, this shrine serves as a perpetual reminder of the ever-presence of that which is other than a purely material concept of daily life. In Japan, shrines are used in factories and plants to provide for the protection of workers against industrial accidents. We were told that the safety record of the personnel of Kyodo Yushi has been at its highest point since the erection of this shrine.

Continued on page 22



J



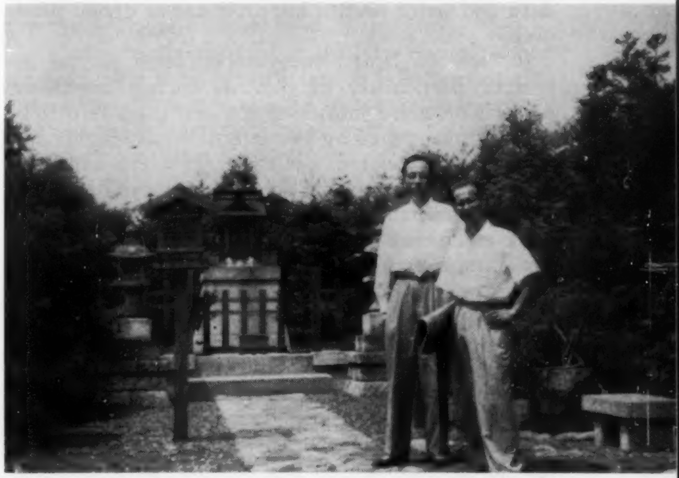
K

J—NEW tankage for storage of lubricating oil components.

K—TANKERS will hold 2000, 3000 and 4000 barrels.

L and M—TOUR finally brought us to that feature of nearly all Japanese plants—the Shinto religious center.

L



M

IV. The Future

Japan's grease industry is vital, active, and progressive. Every effort is being made to improve the quality of production—by the introduction of newer techniques and processes, and by newer types of equipment. There is the immediate goal of complete self-sufficiency for Japan's industries, and there is the promise that in the near future, quantities of high grade greases, produced in Japan, will be finding their way into the markets of Southeast Asia in ever-increasing quantities.

And, traveled members of the petroleum industry will be encountering the products of Japan's grease manufacturers, not only in Japan itself, but in other parts of the world as well. Because, the world will be their "home."

Japan's lubricating grease industry has today reached a sound and enviable position. And tomorrow—whatever else tomorrow will bring—the progress of the past few years certainly will be continued. ■

began to occur testing methods for grease were made strict. Testing apparatus for grease, such as the four-sphere model and the pendulum type oil-property testing apparatus, and others, were popularized under great pressure; and at present companies concerned with lubrication all have a basic selection of testing apparatus, whether they are maker or user. The result of this is that users who had formerly used products on basis of maker recommendations, or simply vaguely with no discrimination, now turn up with numerous involved demands. It is not hard to imagine that grease sellers are having a difficult time in their selling, and actually several such complaints have been registered.

One feels consternation when formally asked what type of grease one wants for bearings. Such reversal of attack has rarely occurred in the author's experience, however, and when such questions did come up requests were made each time for the improvement of points currently giving difficulty, and slow progress was made thus far on a trial-and-error basis.

Bearing and Grease

By Y. MATSUMOTO, Tokyo Bearing Company

Translated by L. C. Brunstrum, Research Department, Standard Oil Company (Indiana)

THAT ROLLER BEARINGS have seen today's development owes much to the benefit of grease, and bearing makers should well be grateful to grease. They should also have concern in grease, and assist and strive toward improvement of grease products.

In view of Japan's meagre petroleum natural resources, particularly in view of current conditions where high-grade lubricants are nearly entirely lacking, the role played by grease is of course highly important; and concern was there since pre-war days. However, the state of affairs seems to have been such that the general level of common sense of machine-work technicians permitted only concern and no active measures. Few machine-work technicians like chemistry, most abhor it, and the words of chemical workers meant little to them. They knew nothing of whether a given product can be used for machines, or in what respects it was inferior; and grease makers themselves gave inadequate explanations for the benefit of these users.

After the war, roller bearings began to be used for vehicles of the National Railway, and after accidents

It is most desirable, of course, that grease makers should produce truly trustworthy material for bearings—grease products that are unfailingly fitted for specific uses of bearings. Unfortunately, it was not possible hitherto in Japan to expect the abundant experience and guaranteed raw materials to enable this, and only through need certain data had been compiled. There have been great improvements in this point recently, but much is still to be corrected. Setting aside what is most desirable, it is necessary for users and makers to cooperate in this matter in view of current conditions: for chemical technicians and machine-work technicians, in other words, to debate and coordinate themselves in order to study for progress.

Grease Life

The product most greatly needed by bearing makers at present is grease for sealed bearings. The appearance of a grease product with a long life-span as the bearings themselves is anticipated, and for this a somewhat higher price will be willingly paid. Although essentially there is no relationship whatsoever between the life of bearings and the life of grease,

were it possible to seal grease in a bearing for ten or fifteen years' use with no deterioration the use of bearings would be greatly expanded, and there would be a great contribution to machine planning.

It is generally recognized that the life of a bearing has come to an end when the rolling surface flakes due to the fatigue of rolling. In the case of grease it is difficult to decide when its life has ended. Although one can claim that it is no longer useful when lubricating power is gone, it will naturally vary depending on use as to how much loss of power will indicate the end of its life-span, and this is indeed a difficult question. There should always be a difference in life span between use at about 50° C. and use at 70° C. Grease property also makes a difference, but if we designate (for grease used most universally in Japan) that cup grease is used at below about 50° C. and fiber grease is used at below 80° C., it is generally recognized that life spans are as follows:

$$D = \frac{10^{10}}{60 \times d.n.H} \text{ .... ball bearing}$$

$$D = \frac{0.8 \times 10^{10}}{60.d.n.H} \text{ .... cylindrical roller bearing}$$

$$D = \frac{0.6 \times 10^{10}}{60.d.n.H} \text{ .... conical roller bearing}$$

$$D = \frac{0.4 \times 10^{10}}{60.d.n.H} \text{ ...... spherical roller bearing}$$

d: axial diameter
n: number of revolutions per minute
H: number of hours of work per day
D: number of days of grease life

When a national product grease of superior grade was used, the maximum life-span up to now has been about twice the calculated value of those listed above.

Grease makers have taken into consideration the possibility of losing work if the life of grease products should become too long, and they seem to recommend that grease be changed after a year or so; but in actual sites of work such yearly change is cumbersome due to such factors as dust and washing. Small-model machines, particularly, and small-model bearings such as conveyor bearings are numerous in number, and when one reflects on the troublesomeness of operations, one cannot help but hope for a life-span of ten or fifteen years. In the case of small-model motors, if we regard that the axial diameter is 25 mm., and operation continues for ten hours every day at 1800 r.p.m., the life will be barely one year according to the calculation set forth above. If grease change is conducted at the site of work one year later there will be intrusion of dust, and bearing abrasion will be speeded up. Motors for agricultural use are also harmed by burning, by too little or too much grease

In these respects, we will be most gratful if the life-span of grease in use today can be extended to five to ten times as long. And we request that it be made clear how much grease life is shortened by temperature action.

Grease for High Velocity Purposes

When a very small quantity of grease, 1-4 mg., is put in a bearing and this is rotated at a relatively high speed (50,000 r.p.m.), the friction increases rapidly in a short period of time (30 minutes or so), and the danger point of lubrication will be reached. Practical tests have been conducted regarding this point, and it is known that above certain limits of high velocity (high d.n values) long hours of operation can no longer be expected of grease. Under the most normal conditions of use, the following velocity limits have been obtained experimentally:

d.n = 160,000 .... ball bearing
d.n = 120,000 .... cylindrical roller bearing
d.n = 100,000 .... conical roller bearing
d.n = 80,000 .... spherical roller bearing
d.n = 40,000 .... thrust ball bearing

By careful use, that is, by observing the grease life-spans as explained above and by taking care that no dust enters, there have been instances where operations lasted without event at nearly twice the values given above; but on the whole the limiting velocities are as given above.

In order to rationalize machines, operational speeds have been raised considerably lately, and although there is a relationship with life-span, grease products with higher limiting velocities are looked for. At a time when properties of oil seals are improving rapidly, there is ample possibility that grease, which is difficult to wash, will be substituted by oils; under the circumstances it would be most desirable if the limiting d.n. values can be raised to about twice as much.

Other Matters

Workers with machines need grease free of dust and foreign matter for purposes of high velocity and of lessening friction wear. Since it appears that dust elimination is impossible after purchasing the grease, serious considerations are awaited.

As one characteristic of grease, the ease of sealing treatment has been pointed out. It is important that the viscosity does not increase and drip out after long hours of use. It is not clearly specified as to what extent of sealing treatment is required to be safe; and clear-cut answers should be given in relation to d.n values and temperature of use.

Conclusion

The problems noted above are those posed by bearings on grease at the present time. Some cannot be solved by grease maker alone, while others cannot be solved by bearing maker alone. It is anticipated that they be solved as soon as possible by the cooperation of both; and the valuable experiences of the users are needed in the solution. Timely suggestions from the users will be appreciated. ■

Reprinted from Kyodo Grease Times, November, 1955.

By J. H. Flanagan
Standard Oil Company (Indiana)

PREPARING THE SALES PROGRAM

Calculated to Successfully Market a Lithium Multi-Purpose Grease

Brief History

FIRST ANNOUNCEMENT OF such a product was made in mid-1953. It was believed at that time the biggest chance for acceptance would be in the construction field and among large for-hire freight and passenger carriers. This belief was tied in with the characteristic high turnover of employees of such concerns who are assigned the job of lubricating equipment. The fact that they could not apply the wrong product, if only one was involved, was considered ample justification for the higher price of the lithium product. It was not believed originally that farm consumers or service station dealers would manifest interest. But in the short period since mid-1953 our sales of automotive-type greases have come to be made up of the two grades of lithium multi-purpose grease to the extent of 65% of the total. Our half-year manufacturing budget for the latter half of 1953 was 1,500,000 pounds (one grade). Our 1956 budget two grades is 10,250,000 pounds. All classes of customers became interested in the "lithium" greases.

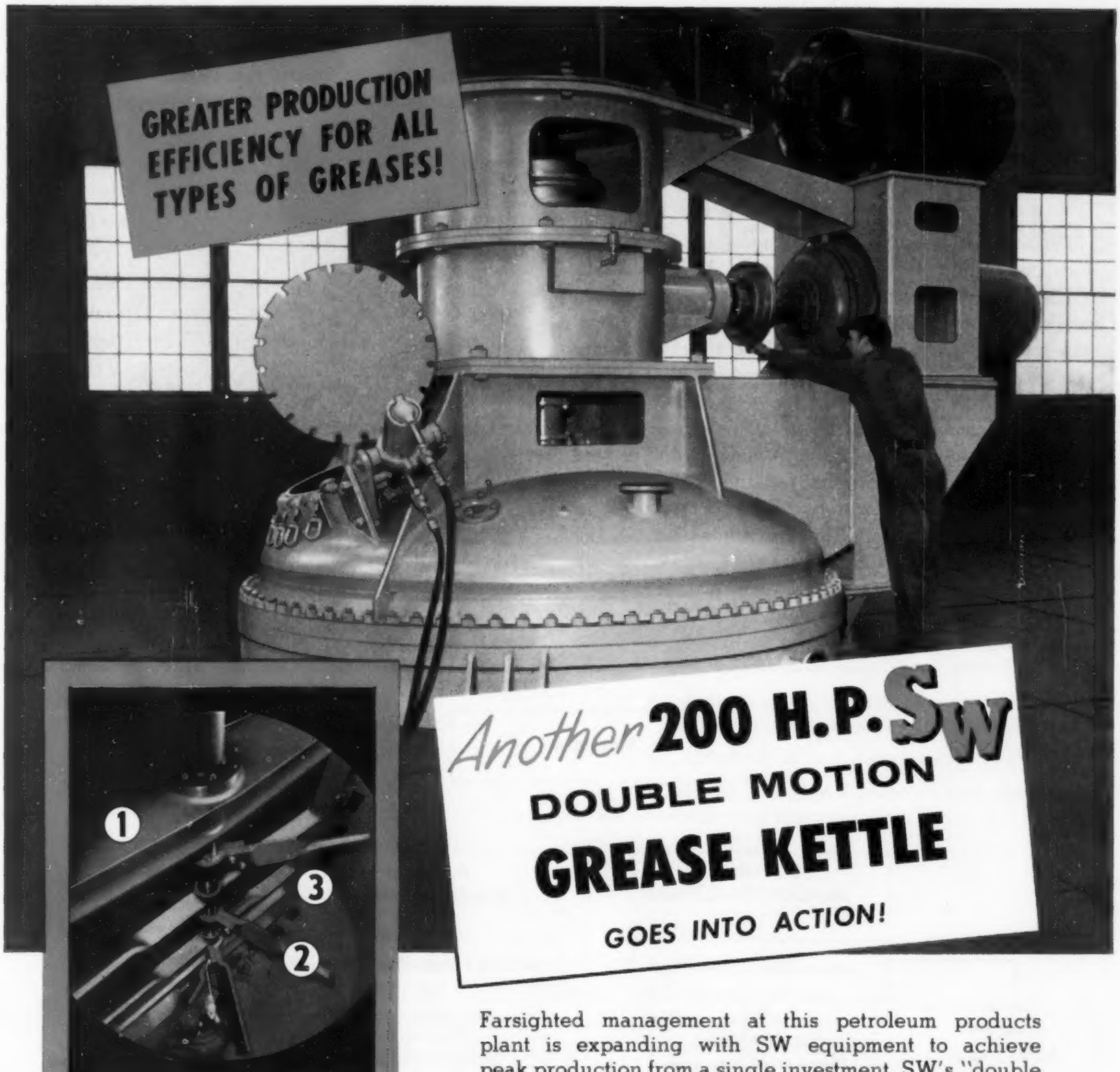
Generally, our programs are expected to produce sales results with regard to the complete line of motor oils, greases, and gear lubricants. Within their framework we have always found it possible to exert a major part of the emphasis on one class of product.

"SAMPLE is packaged in five ounce tooth paste tube."

Sales Personnel

Twenty-three sales divisions arranged in nine regions. Top level supervision is exercised by the nine regional and 23 divisional managers. Typical divisional set up is Table I.

At the very front line it should be kept in mind that lessee dealers are independent businessmen operating service stations leased from our company. Agents and sales agents are exclusive employees working on a commission. Agent's salesmen are employees of agents and sales agents. They do not work for our company. Agents and sales agents



Another 200 H.P. SW DOUBLE MOTION GREASE KETTLE GOES INTO ACTION!

1. Heavy duty, scraper frame with rugged paddle arms for high H.P. input.
2. Counter-rotating de-stratifying arms of extremely heavy construction for high H.P. input.
3. Hinged scraper blades contact 98% of inside surface for the ultimate in heat transfer efficiency.

Farsighted management at this petroleum products plant is expanding with SW equipment to achieve peak production from a single investment. SW's "double motion" mixing equipment gives fast, efficient, and thorough grease processing that will automatically increase your product yield. SW Grease Kettles can be supplied in steel or alloy material and can be designed for direct fire or steam jacket heating. Send us your mixing problem!

STRUTHERS WELLS *Corporation*

WARREN, PA. — Struthers Wells — Plants at Warren, Pa. and Titusville, Pa.

Offices in Principal Cities

STRUTHERS WELLS PRODUCTS

PROCESSING EQUIPMENT DIVISION

Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

BOILER DIVISION

BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

FORGE DIVISION

Crankshafts . . . Pressure Vessels . . . Hydraulic Cylinders . . . Shafting . . . Straightening and Back-up Rolls

MACHINERY DIVISION

MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies

sell and deliver to consumer customers and deliver to a portion of the service station dealers. (Other dealers in population centers are supplied by salaried drivers.) It should be understood that the foregoing statements about supply are confined to the supplying of greases.

Sales Aids

Demonstration sample is packaged in five-ounce tooth paste tube. It is easy to carry. It lends itself to showing the actual product to the customer, and for demonstrating it. Our provisions for the year 1956 were to provide 20,000 of these tubes or about three for each sales representative who calls on customers. Perhaps this is more than we need or less. A year's experience will tell the story. Favorite demonstration in front of customer is to put a "*gob*" of this grease and conventional grease on the exhaust manifold of the sales representative's car or truck. The conventional grease melts quickly while the lithium grease stays put. This quickly impresses the customer with the heat resistance of the lithium product.

Selling Literature

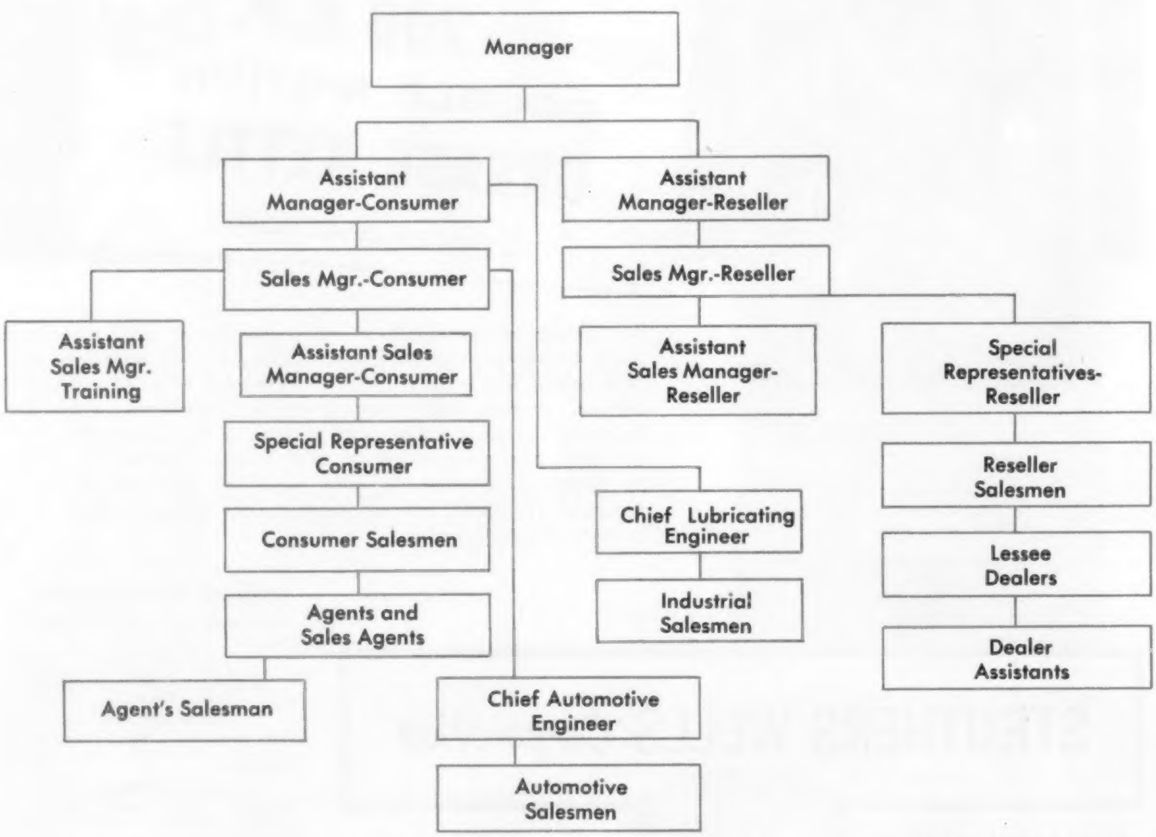
For use by the many representatives who solicit the farm trade, we provide a combination product-sales presentation card and price card. This is one of several which in total cover the principal selling motor oils and greases and gear lubricants. They fit into a convenient slot on the inside front cover of the permanent holder for the order book.

For use by other sales representatives calling on the larger consumers and dealers, we have the sales manual product sheets. They can be used in a regular three ring sales portfolio, or they can be kept in the regular sales manual binder. Most of these sales will be transacted with customers buying on a motor oil and automotive lubricants contract, and the price list should be part of the selling equipment.

Timing of Sales Programs

Seasonal variations fix the timing for our selling efforts to service station dealers as follows:

TABLE I Twenty-three sales divisions in nine regions. Top level supervision is exercised by the nine managers.



LITHIUM Base Grease:

1μ

Micrograph showing soap structure of lithium base lubricating grease made from 12-hydroxy stearic acid. Courtesy of Sinclair Research Laboratories, Inc.

ITS
MULTI-Properties
MAKE IT
MULTI-Purpose

IN CHARACTERISTICS

- Non-corrosive
- Water resistant
- High heat resistance
- Rheological properties
- Eliminates abnormal wear
- Soap oxidation stability
- Cold operating properties
- Oxidation and shear stability
- Mechanically and chemically stable

IN APPLICATION

- Prepacking anti-friction bearings
- Lubrication of plain and anti-friction rotating bearings
- Lubrication of vehicle chassis points, wheel bearings, universal joints and water pump
- Lubrication of high-temperature ball bearings
- Aircraft, artillery, instrument and general ordnance maintenance

IN MARKETING

- Lower inventory
- Less dispensing equipment
- No chance for misapplication
- Reduction in lubricating time
- One grease lubricates a vehicle

IN INDUSTRY

- Ordnance
- Manufacturing
- Farm equipment
- Transportation
- Industrial maintenance

TEN YEARS PRODUCTION EXPERIENCE AT YOUR DISPOSAL

Lithium Corporation enjoys an established acceptance among grease makers—and for "multi-reasons" too: production experience, unsurpassed facilities, available inventory and immediate shipment—all combine to assure a reliable source of consistently uniform $LiOH\text{-}H_2O$. Since we are equally interested in developing better lithium products, why not get in touch with us on your lithium hydroxide problems? A card or letter will bring immediate response.

trends ahead in industrial applications for lithium

LITHIUM CORPORATION OF AMERICA, INC.
2575 RAND TOWER, MINNEAPOLIS 2, MINN.

PROCESSORS OF LITHIUM METAL • METAL DISPERSIONS
METAL DERIVATIVES: Amide • Hydride
SALTS: Bromide • Carbonate • Chloride • Hydroxide • Nitrate
SPECIAL COMPOUNDS: Aluminate • Borate • Borosilicate • Cobaltite • Manganite
Molybdate • Silicate • Titanate • Zirconate • Zirconium Silicate

BRANCH SALES OFFICES: New York • Chicago • Bessemer City, N. C.
MINES: Keystone, Custer, Hill City, South Dakota • Bessemer City, N. C.
Cat Lake, Manitoba • Amos Area, Quebec
PLANTS: St. Louis Park, Minnesota • Bessemer City, N. C.
RESEARCH LABORATORY: St. Louis Park, Minnesota

January-February—The Mid-Winter Lubrication Needs

March-May 31—The Spring Change Period

June 1-August 31—The Vacation Period

September 1 to December 31—Getting Ready for Cold Weather

Programs offering incentives to the customer to buy during certain fall months and spring months seem to produce best results in the farm market and among the small volume in town consumer customers. There is need for some continuing incentive of lesser amount in other months to meet emergency needs. The industrial consumers and commercial consumers tend to buy on an even-flow basis, either throughout the year or throughout the construction season. Thus, programs for reaching this class of trade of necessity must be of the "*Constant Effort*" type.

Other Direct Influencing Factors

Service Station Sales

Each spring, when the lubrication guide becomes available, an organized presentation should be made available to reseller salesmen who should distribute the guides and solicit a grease order when so doing.

Salesmen furnish drain tabs and wall charts to service station dealers at regular recurring intervals. When furnishing a supply, contacts should be utilized to solicit a grease order.

Consolidating all the sales aids into a brochure affords the salesman a selling tool to utilize in promoting lubrication service merchandising which should always be at a time when a grease order is solicited.

Maintain a dealer purchase record to be posted by salesmen. When monthly postings are made, a logical opportunity to solicit a grease order is afforded.

Endeavor to have dealers maintain a record of retail lubricating job sales and work toward a goal of eight to ten lubrication jobs per 1000 gallons of gasoline. This will enhance dealer profits in all income classifications and increase grease sales.

Consumer Sales

Sales contests during lull periods seem to maintain interest both in the area of selling to farmers and as well as to commercial and industrial consumers. Our practice is to have these contests wind up as of June 30. If a good start is not attained earlier in the year, an opportunity, particularly in the rural, is afforded during a relatively slow month like May to put on a blitzkrieg and wind up with a six months' gain.

Recent contests we have conducted during this period are:

1954—Angling for grease sales. Pay off a limited number of spinning rods and reels and tackle boxes.

1955—Sharpen up your sales approach. Increase grease sales. Pay off a limited number of Cory electric knife sharpeners.

1956—Lighting the way to more grease sales. Pay off several hundred giant combination search lights and electric blinkers.

Adequate Products Stocks

We make a 100% inventory check by brand and package at every storage point on June 30 and December 31. Once this was started, it was possible to add shipments and subtract closing inventories and thus establish sales by brand and package for each six months' period by sales division. We are able, therefor, to estimate sales flow and by allowing for a reasonable increase over the previous year barring some abnormal situation we are able to maintain adequate stocks and in the case of a fast-moving product like a lithium multi-purpose grease we are able to average an inventory turnover of 2.6 times per year. (If any extended stocking period is involved, we organize a committee that meets weekly to follow up all phases of stocking.)

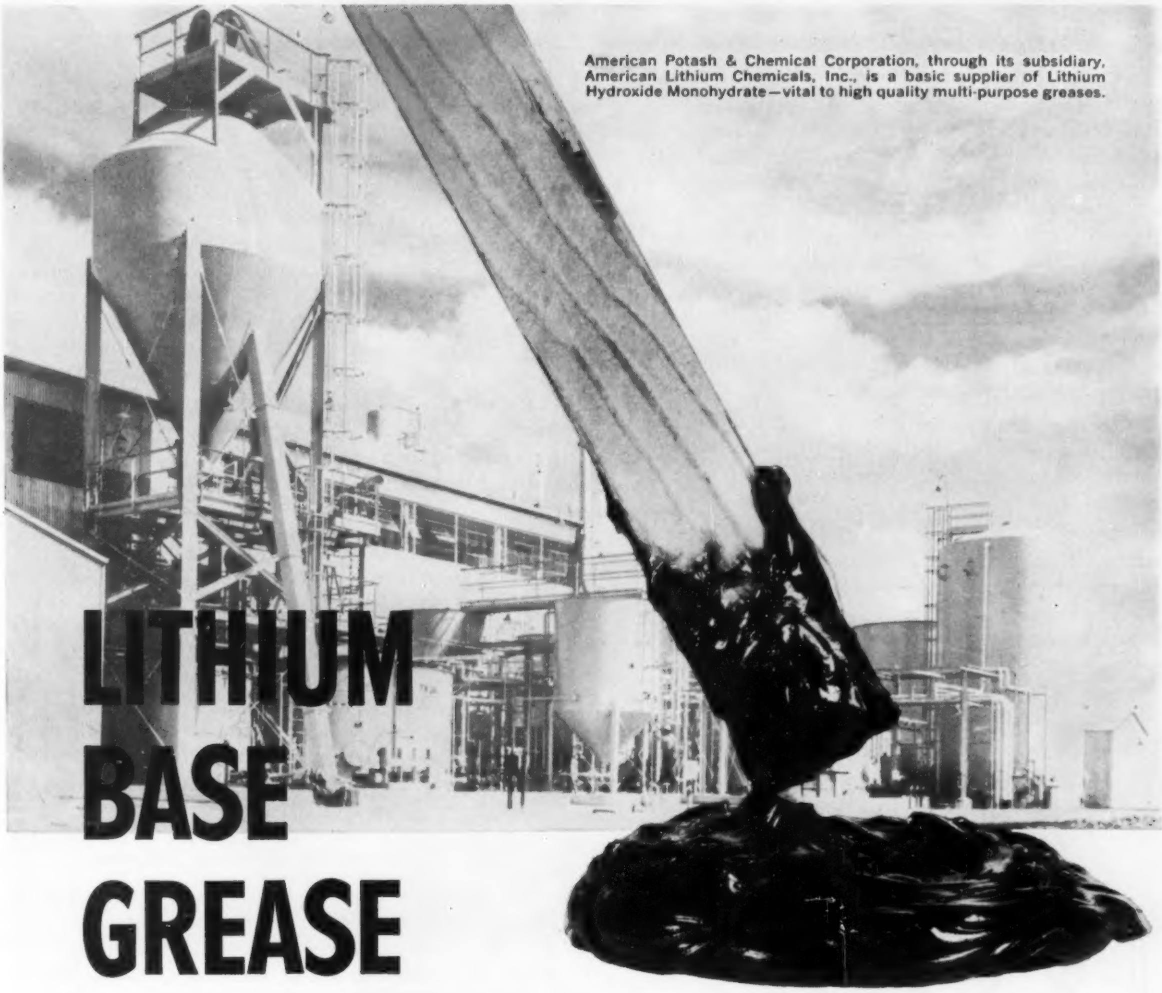
Special Service Station Level

Our reseller salesmen use inventory selling forms during the stocking period concerned with the spring and fall merchandising programs. These seem to result in adequate stocking by service station dealers.

Program Announcement Letter

Get it in the mail sixty days before the program is to go into effect. If there are any supporting materials such as direct mail selling brochures, etc., have them

DEMONSTRATION stimulates products sales meetings.



LITHIUM BASE GREASE

one grease...in place of many ...for industrial lubrication needs!

Multi-Purpose Grease provides these outstanding properties...

- Water resistance
- High temperature bearing performance
- Low temperature pumpability
- Greater chemical and mechanical stability
- Stepped-up oxidation resistance
- Rust and corrosion prevention

"ONE-TYPE" grease for every purpose can now prevent the misapplication of lubricants in equipment, provide economies in storekeeping and manpower by eliminating special-purpose grease products. Lithium-base, multi-purpose lubricants simplify maintenance and minimize dispensing equipment required in industrial, farm and mobile equipment. A vital ingredient in these tough and versatile greases is Lithium Hydroxide Monohydrate, which imparts the ability to withstand wide ranges in temperature, water contamination and variable loads and speeds. For everything—from electric motors to locomotives—lithium-base greases will do the job and do it better.

Write for informational bulletin containing technical data on Trona* Lithium Hydroxide Monohydrate.

*TRADEMARK AP&CC

TRONA **American Potash & Chemical Corporation**

OFFICES • 3030 West Sixth Street, Los Angeles 54, California
99 Park Avenue, New York 16, New York
235 Montgomery Street, San Francisco 4, California
1320 S.W. Broadway, Portland 1, Oregon
214 Walton Building, Atlanta 3, Georgia

Producers of: BORAX • POTASH • SODA ASH • SALT CAKE • LITHIUM • BROMINE • CHLORATES • PERCHLORATES • MANGANESE DIOXIDE • *and a diversified line of specialized agricultural and refrigerant chemicals*

arrive at division warehouses at least thirty days before the program is to go into effect. If mimeographing specialists are available, produce an illlustrated letter. If local sales divisions prepare any local prospectus (this should be encouraged), a good tie-up with the announcement letter is to furnish a prospectus with an illustrated front cover and duplicate this front page in quantity so it can be used as a cover for the illustrated letter. Do not make the letter any longer than is necessary to cover all essential details.

Follow-up Sales Letters

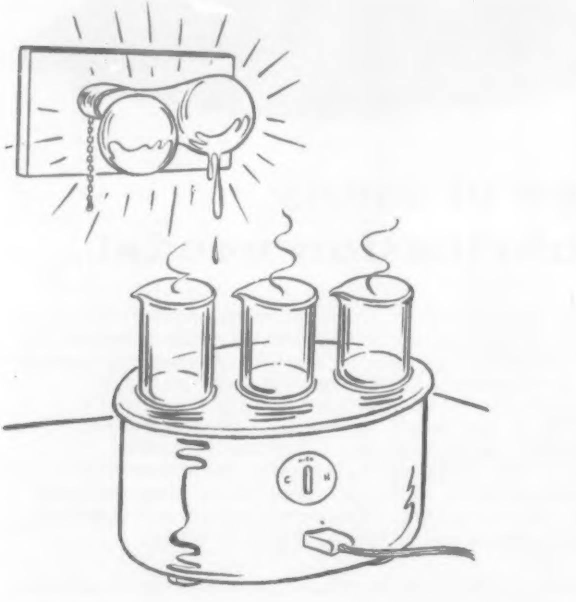
Prepare a letterhead which will tie in with the illustrations on the announcement letter.

Bulletins on this letterhead ranking division in terms of percentage of objective attained seem to find favor if the original objectives are fixed on a fair and realistic basis.

Objects which can be affixed to a letter to demonstrate a point, old shoe sole, worn-out sock, old razor blade, miniature three-cornered pants all can be tied to the phrase, "It's time to change." This generalization can be used to keep interest sustained during a change-over season.

The use of plastic objects cemented on to paper thus permitting the "rebus" style approach in a short promotional bulletin seem to attract interest.

Cartoon bulletins published weekly all tying in with some one theme such as "It is time to lubricate!" have attracted interest.



TWO light bulbs will serve for the product demonstration hot and three beakers can show water resistance.

Interest Stimulating Product Sales Meetings

A typical example of an actual meeting would be the best way to approach this phase of the subject.

The product—an all-purpose lithium grease.

The product demonstration cold.

Mount three simulated bearings on spindles on a piece of plywood, pack them with conventional chassis grease in one, soda soap grease for another, lithium grease for third. To the top of each is affixed a thin wire with a hook on the other end on which weights can be suspended. Put entire assembly in box surrounded with dry-ice. After a few minutes, take out and add weights to the three hooks. Lithium grease will require less weights to move the simulated bearing thus demonstrating its ability to resist cold without becoming too thick.

The Product Demonstration Hot

Have two light bulbs connected to a source of electricity and mounted on a piece of wood. Put a gob of conventional chassis lubricant on one and a gob of all-purpose lithium grease on another. Turn on the juice and soon the conventional product will melt and run off while the lithium grease still stays put. (The front line sales representative can put on the same demonstration by putting gobs of the two greases side by side on the exhaust manifold of his car.)

The Product Demonstration for Water Resistance

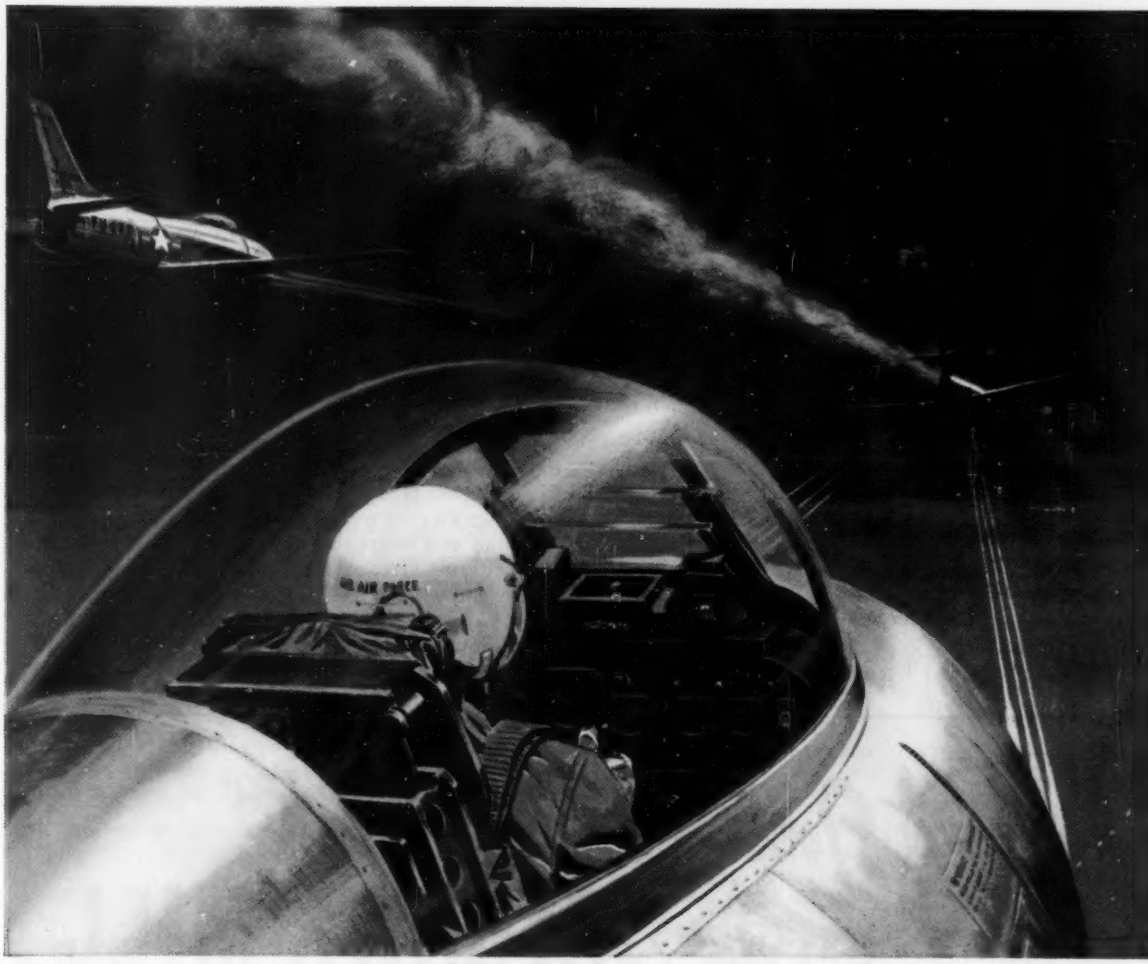
Three beakers on hot plate; fill with water; heat to boiling. Drop some conventional lime soap into one. It melts. Drop some conventional soda soap into another. It emulsifies. Drop some all-purpose lithium grease into another. It remains intact. Coat a portion of the inside of an Erlenmeyer flask with a soda soap grease. Coat another with all-purpose lithium grease. Fill partially with cold water and shake vigorously. The layer on the flask coated with soda soap tends to break down and disassociate; the layer of all-purpose lithium grease remains unaffected.

Product Demonstration—Resistance to Change in Consistency in Working

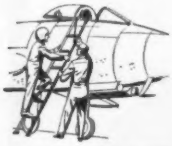
Using conventional grease workers, work soda soap grease sixty strokes up and down, work lithium grease sixty strokes up and down. Soda grease will tend to become semi-fluid and can be poured from the grease worker. Lithium grease will be relatively unchanged in consistency and will not pour from the grease worker.

Other demonstrations somewhat more complicated which will illustrate pumpability, storage, and stability could be devised.

Continued on page 32



PROTECTION is our business, too



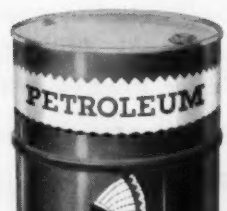
As alert jet pilots of this country's air defense stand always ready to guard our nation's security—Jones & Laughlin Steel Containers protect your products by providing dependable packaging that assures safety in transportation and storage. Precise fabrication provides accuracy in all fittings and closures.

J&L drums and pails are chemically cleaned and dried by the JaLizing process. This assures a clean and dry, rust-inhibiting surface and increases the adherence and durability of decoration and interior lining.

Special protective interior linings are available to provide the best possible packaging for your products.

Jal-Coat, J&L's lithographing process, applies your trademark and sales message to the finished container . . . *no side seam touch-up is ever required.*

Plants located at Atlanta, Ga.; Bayonne, N.J.; Cleveland, Ohio; Kansas City, Kansas; Lancaster, Pa.; New Orleans, La.; Philadelphia, Pa.; Port Arthur, Texas; and Toledo, Ohio.



Jal-Coat, J&L's exclusive color lithographing process, adds sales appeal to your products.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

CONTAINER DIVISION
405 LEXINGTON AVE., NEW YORK 17, N. Y.

About the Author

J. H. Flanagan joined Standard Oil company (Indiana) in 1930 and since 1938 has been the company's merchandise manager in motor oils and automotive lubricants. Flanagan's beginning years were with the departments of sales engineering and market research. A graduate of Michigan State University, Flanagan received his degree in chemical engineering in 1924. Before joining Standard Flanagan worked in the metallurgical department of the Chicago Pneumatic Tool company.

Preparing the Sales Program

Continued from page 30

Recitation of facts concerning selling accomplishments would be valuable. In this instance, an experienced sales employee narrates the individual experiences on every sales contact made during a two or three day period. Opportunity is afforded him to show how he overcame various kinds of resistance such as: price, satisfaction with the product, I have enough on hand.

Assign individual objectives. Close meeting on an inspirational note.

In this brief period I have tried to explain to you some highlights of the programs we have followed to build up our sales of lithium multi-purpose greases. They have certainly been translated into results when it is considered that in three years we started from scratch and are now able to sell about two-thirds of our volume in the form of these higher priced lithium soap greases. It was not until we achieved this performance that we were able to maintain total grease inventories at a desired level, and our net profit on the sale of grease after all marketing costs, has gone from a deficit to a black figure. It is hoped that in this short discussion it has been possible to leave with you some impressions which may be of value to you in carrying on similar sales programs. ■

THE RAINBOW—

Does It Point to a Pot of Gold?

By M. EHRLICH, American Lubricants, Inc.

EDITOR'S NOTE—*The article written below was offered by Mr. Ehrlich and is an expression of his opinion . . . it does not reflect the opinion of the editor or the Board of Directors of the National Lubricating Grease Institute. Mr. Ehrlich is vice president of American Lubricants, Buffalo, N. Y., and is active in NLGI Technical Committee activities. He has previously authored technical features for the* NLGI SPOKESMAN.

IN ANY HUMAN endeavor, new moves must be considered, not only as to how they will affect us at once, but also for long-term implications. Our history and literature are full of examples of the need for such long range thinking.

This point is capable of much amplification, and has many fascinating ramifications. But this is being written because of what I believe to be urgent considerations facing the lubricating grease industry. One current trend has some extremely serious long-range implications; but we are losing sight of these in our jockeying for short-term sales advantages. This is intended as a brief discussion of the problem, a presentation of a possible approach, and a warning.

Sales angles must be considered in the formulation and development of all products. Even giveaways are concerned with their appeal or lack of appeal to the recipient. There can be no doubt that attractive greases will have sales appeal; and sales appeal sounds good to every manufacturer and marketer.

Yet we are not producing consumer products in the usual marketing sense of the word, but rather technical or engineering materials. Blue coal, and blue gasoline, and a blue dress have virtues—sometimes for their identification features, and sometimes for aesthetic reasons. Mixing blue coal and red coal, or blue gasoline and red gasoline, should cause no trouble for the consumer. And the mingling of a blue dress with a red sweater may even have its attractive aspects to both the consumer and impartial observer. However the mixing of a blue grease and a red grease could lead to trouble.

Some lubricating greases are operating under conditions so mild that a large factor of safety exists. Others are lubricating quite adequately, but with little margin between the capabilities of the lubricant and the requirements of the application. Such a narrow margin is not infrequent, sometimes because price is so large a consideration that a more suitable lubricant will not prove acceptable; sometimes because one lubricant is operating in many applications, leading to compromises; and often because a well-lubricated machine is later run under higher speeds and loads, thereby decreasing the factor of safety.

Not too many years ago, the question of grease compatibility was generally avoided. Lubricating greases were made generally from three soaps—one for high-temperature, and two for ordinary-temperature applications. Contamination did occur, but compatibility was not a widespread problem. In recent years, a number of papers have indicated the extent to which compatibility should be considered.

In marketing dyed greases though, we expect a marked increase in the extent of compatibility involvements. Look at it from the grease user's viewpoint. He is told to stop thinking about what grease suits a given application, but to use, for example, "the red grease." Greases made from a variety of thickeners, both soap and solid, are marketed in red color. Any one of these in the right grade might perform well in a given application. But some mixtures of these lubricants would cause equipment to fail. Thus the "use the red grease"

marketing aid can lead directly to service complaints.

Other problems must be considered as well. Cost of dye is significant. A suitable color may be achieved inexpensively; but some dyes add significantly to material cost. Furthermore, in order to make some colors show up, lighter colored, more costly oil stocks are required. Thorough kettle cleaning becomes more important. The thorough cleaning of accessories—pumps, lines, valves, filters, mills, etc.—is made more necessary, yet extremely difficult, further adding to costs. The dye powders get into the strangest places, showing a close resemblance to the fabulous fellow on the flying trapeze. To compensate for all of these costs, a significant increase in lubricant price is inevitable. Yet none of these costs is nearly as significant as the possibility of service failures due to incompatibility of similarly-colored greases.

Must we then relinquish the virtues of dyed greases, or is there a solution? I believe a remedy can be found —on an industry wide basis. A committee could be created, whose function would be to explore the problem of artificially colored greases, in all its ramifications (and these are legion, since distinctively colored oils have long been employed with similar intent). Perhaps an industry wide color coding system could be created, based on the type of thickener used. Some may prefer a system based on intended use, although this will not eliminate the complications inherent in the chemistry of thickeners. And possibly careful deliberation will only lead to the conclusion that nothing can be done.

But I must express the hope that action, spearheaded by the NLGI, will be prompt and effective. We who make greases have problems. But the key to the whole matter lies with the user. We may confound him with color in addition to the confusions which are inherent in our variety of products, brand names and market-methods. As we compound the complications, we increase the likelihood that future equipment will not be grease lubricated. Thus in attempting to strengthen marketing, we may weaken the entire market.

We have a strong industry. Let us keep it so!

*Proudfoot, NLGI SPOKESMAN *15*:9 (1951). O'Halloran, U. S. Pat. 2,588,279 March 4, 1952. Ehrlich & Sayles NLGI SPOKESMAN *17*:11 (1954). McClellan & Calish, *Lubrication Engineering 11*:6 (1955).

Patents and Developments

Complex Basic Aluminum Soap Greases

Greases having the combined characteristics of high water resistance and high melting point, which characteristics are obtained in a composition containing a complex basic aluminum soap, e. g., basic aluminum, benzoate stearate, as the principal thickening agent, are described in U. S. Patent 2,768,138 issued to California Research corporation.

Now by the use of the grease composition of this patent, it is possible to obtain one grease which has the combined characteristics of high water resistance and high melting point, as well as oxidation resistance. Such a grease has a wide variety of applications, particularly where both water and high temperatures are encountered, such as in steel mill rollers and transfer table bearings, paper mill roll bearings, automotive wheel bearings under winter and flood conditions including use in amphibious military vehicles, high temperature cannery equipment, exposed control surface bearings for aircraft, etc.

By complex basic aluminum soaps is meant that the aluminum soap molecule contains at least one hydroxyl anion for each aluminum cation, and at least two dissimilar anions substantially organic in character (i. e., substantially hydrocarbonaceous in character), the aluminum di-soaps of said organo anions being water-soluble and preferably different in the extent of their individual solubilities in lubricating oils.

The organo anions (or anions substantially hydrocarbonaceous in character) of the aluminum soaps of this patent are generally oleophilic (i. e., anions derived from acids which are oil-soluble); however, one organo anion has a greater solubility in lubricating oil than another organo anion. For purposes of simplification of the discussion of the characteristics of the organo anions of the complex basic aluminum soap, the organo anions of greater oil solubility are designated as "relatively oleophilic" anions, and the organo

anions of lesser oil solubility are designated as "relatively oleophobic" anions.

In order to characterize further the organo anions of the aluminum soaps of this patent, characteristic properties of each of the organo-anions are noted as follows:

The basic complex aluminum soaps are prepared from acids substantially organic in character, at least one of which is relatively oil-soluble and another of which is relatively oil-insoluble. That is, the organo-acids of the relatively oleophilic anions are relatively oil-soluble, while the organo-acids of the relatively oleophobic anions are relatively oil-insoluble, i. e., less oil soluble as compared to the oleophilic organo-acids.

The aluminum di-soaps of each of the organo anions (i. e., the aluminum di-soaps of the oleophilic anion and the aluminum di-soaps of the oleophobic anion) are insoluble in water. For example, in the aluminum-benzoate-stearate example of this patent, the aluminum di-soap of the benzoate anion (i. e., aluminum dibenzoate) and the aluminum di-soap of the stearate anion (i. e., aluminum di-stearate) are insoluble in water.

The aluminum di-soaps of the more soluble organo-anions (i. e., the relatively oleophilic anions) are soluble in the base lubricating oil in an amount of at least 5% at 400°F. That is, at 400°F., 5% of the aluminum soap of the oleophilic organo-anion will form a true solution in the base lubricating oil. On the other hand, the aluminum soaps of the less soluble organo-anions (i. e., the relatively oleophobic anions) are soluble in the base lubricating oil in an amount of less than 1% at 400°F. That is, at 400°F., less than 1% (from 0% to about 1%) of the aluminum soap containing the oleophobic anions will dissolve in the base lubricating oil to form a true solution. For example, in the aluminum-benzoate-stearate, the aluminum di-soap of the benzoate anion (i. e., aluminum di-benzoate) is soluble in lubricating oil in an amount less than 1% at 400°F., while the aluminum di-soap of the stearate anion (i. e., aluminum di-stearate) is soluble in lubricating oil in an amount of a least 5% at 400°F. Furthermore, the aluminum soaps of the relatively oleophobic anions melt at a temperature above 400°F., and the aluminum soaps of the relatively oleophilic anions melt at a temperature less than 350°F.

Suitable relatively oleophilic anions are anions of aliphatic (saturated and unsaturated), aromatic, aralkyl, and cycloaliphatic monocarboxylic acids, and organo-substituted acids of sulfur and/or phosphorus. The acids must be sufficiently hydrocarbonaceous in character to impart the desired oil solubility, depend-

ing upon the base oil employed as noted above. Thus, the aliphatic (saturated and unsaturated) carboxylic acids may contain from 8 to about 30 carbon atoms, preferably from 12 to 18 carbon atoms. The aliphatic substituent in the various cyclic carboxylic acids may contain a total of about 16 carbon atoms. The relatively oleophilic anion may also be derived from phenols; that is, the oleophilic anion may be an alkyl phenol containing at least 4 carbon atoms in the alkyl group, perferably 16 carbon atoms in the alkyl group; e. g., cetyl phenol. It is preferred that the organo-substituted acids of sulfur and phosphorus contain at least 14 carbon atoms, and more especially at least 20 carbon atoms, in the organo substituent. The oleophilic acid anions may contain various substituents, such as hydroxy, amino, alkoxy, e. g., methoxy, and like radicals, so long as the anion remains substantially hydrocarbonaceous in character.

Relatively oleophilic anions can be derived from dibasic acids, provided that the aluminum di-soaps of such anions have solubility characteristics as defined hereinabove. Such dibasic acids have highly branched hydrocarbonaceous groups. For example when one of the methylene groups of adipic acid has an aliphatic group containing 16 carbon atoms attached thereto, the resulting anion is a relatively oleophilic anion for the purpose of this patent.

Examples of the carboxylic acids from which the oleophilic anions are derived are: caprylic acid, capric acid, lauric acid, 12-hydroxy stearic acid, oleic acid, dodecyl benzoic acid, cetyl benzene sulfonic acid, a di-dodecyl benzene sulfonic acid, (e. g., a di-polypropylene benzene sulfonic acid), an alkane phosphonic acid having at least 24 carbon atoms in the alkane group, cetyl thiophosphoric acid, naphthenic acids, branched dibasic acids containing radicals of at least 14 carbons substituted on a methylene group of the dibasic acids (e. g., beta-tetradecyl adipic acid), etc. Of these, stearic acid, hydroxy stearic acids, naphthenic acids of molecular weights above about 250, and alkyl benzene sulfonic acids having at least 20 carbon atoms in the alkyl substituents are preferred.

The relatively oleophobic anions are substantially hydrocarbon in structure and may be selected from anions of aliphatic (saturated and unsaturated), aromatic aralkyl, alkaryl and cycloaliphatic monocarboxylic acids. For the desired properties, aliphatic monocarboxylic acids having from 4 to 7 carbon atoms are employed. When aralkyl and alkaryl monocarboxylic acids are used, the alkyl groups contain no more than 3 carbon atoms in addition to the carboxyl carbon. Thus, alkaryl and aralkyl monocarboxylic acids contain a total of no more than 10 carbon atoms, preferably a total of 8 carbon atoms. Acids having two carboxyl groups can also be used;

however, the monocarboxylic acids are especially preferred.

When the carboxylic acid contains two carboxyl groups, the acid contains from 8 to 11 carbon atoms, and in some cases up to 20 carbon atoms, so long as the anion resulting therefrom is relatively oleophobic. The greater the number of carbon atoms in the dicarboxylic acid anion the less preferable is branching of the hydrocarbon porton: i. e., the higher the molecular weight the more the hydrocarbon portion should be confined to a straight chain between the carboxyl groups. However side chains such as alkyl groups on the alkylene portion connecting the carboxyl groups are not objectionable provided the resulting anion is relatively oleophobic as defined above. For example, when suberic or azelaic acids have alkyl substituents containing 3 or 4 carbon atoms, the aluminum di-soaps of such substituted suberic or azelaic acids are soluble in oil in amounts less than 1% at 400°F. Thus such anions are still relatively oleophobic for the purposes of this patent. On the other hand, if the azelaic or suberic acids should contain aliphatic substituents having 8 or more carbon atoms, the resulting anions would be too oil-soluble and not suitable as the relatively oleophobic anion in the complex aluminum soaps for the grease compositions according to the present patent.

When complex aluminum soaps are formed with organo anions which are not relatively oleophilic and relatively oleophobic as defined above, the resulting soaps do not yield the water-resistant, high-temperature greases. Thus, a complex aluminum soap may be formed with an anion, the aluminum di-soap of which is water-soluble, in place of the oil-soluble relatively oleophobic anion of the present patent. However, when such a soap is dispersed in oil by devious means to form a grease, the grease lacks high melting point and resistance to emulsification at high temperatures, which properties are characteristic of the greases of the present patent. For example, aluminum nitrate was added to an aqueous solution containing a mixture of potassium adipate and potassium stearate, and the aluminum soaps separated therefrom. When this soap mixture was incorporated into a petroleum oil, the resulting grease had the characteristics of an ordinary aluminum stearate grease, not in the least similar to the water-resistant, high temperature greases of the present patent.

Suitable oleophobic anions are derived from: benzoic acid, methyl benzoic acid, ethyl benzoic acid, toluic acid, phenyl acetic acid, etc. Of these, the benzoic, azelaic and toluic acids are preferred.

Because of the increased effectiveness in obtaining a high melting, high water-resistant grease, it is preferred that the oleophilic anion of the aluminum soap of this patent be an anion of an aliphatic carboxylic acid (e.g. stearic acid), and that the oleophobic anion be an anion of an aromatic carboxylic acid (e.g., benzoic acid).

It is essential to success that the more oil-soluble organo-anion (i.e., the relatively oleophilic group) and the less oil-soluble organo-anion (i. e., the relatively oleophobic group) be present in such proportions to each other that the complex aluminum soap of this patent will have the desired dispersability in the base oil to bring about the formation of a grease structure having high-melting, high water-resistant characteristics. The ratio of oleophobic to oleophilic anions in the average molecule of the soap has a preferred value from about 0.3 to 3; however, the ratio of oleophobic to oleophilic anions may have a value ranging from about 0.2 to about 5.

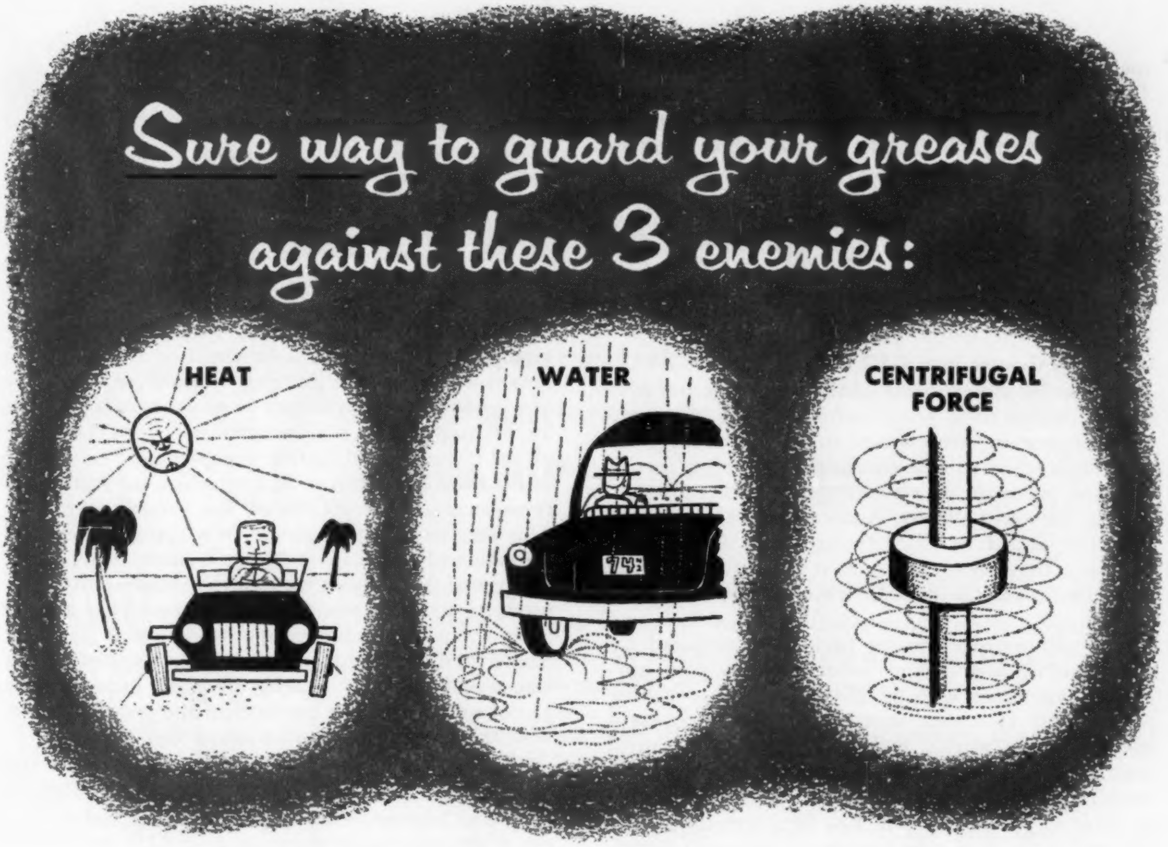
The ratio of oleophobic anion to the oleophilic anion (on an average molecule basis) can be altered so that the desired grease structure may be obtained in lubricating oils of varying solvency characteristics. That is, it is generally desirable when using a lubricating oil of high solvent capacity to employ a basic aluminum soap which is less oil-soluble than the basic aluminum soap preferred when the lubricating oil is of a low solvent capacity. For example, when using a petroleum lubricating oil which is almost devoid of aromatic hydrocarbons, it is usually desirable to use a basic aluminum soap of this patent wherein the oleophilic anion is considerably more oil-soluble than the oleophobic anion. On the other hand, when using a petroleum lubricating oil having considerable quantities of aromatic hydrocarbons present, it is desirable to use a basic aluminum soap of this patent wherein the oleophilic anion is not too highly oil-soluble. Stated in another manner, greases prepared from the aluminum soaps of this patent normally become more gelatinous as the aniline point of the oil and the oleophobic-oleophilic anion ratio are lowered. Conversely, greases become more granular as these variables are raised.

A number of free hydroxyl groups present in the basic aluminum soap of this patent may vary from 1.0 to 1.5 hydroxyl groups for each aluminum atom in the soap. When there is substantially less than one free hydroxyl group for each aluminum atom in the soap, the resulting aluminum soap has a higher degree of acidity than that which is normally desired in greases. On the other hand, when there are as many as two hydroxyl groups per aluminum atom in the soap, the grease prepared therefrom is somewhat granular. Thus it is preferred that the basic aluminum soaps of this patent contain from about 1 to about 1.5 hydroxyl groups per cation.

Example—The preparation of aluminum azelate stearate

A mixture of 13.5 parts by weight of commercial stearic acid (approximately 60% stearic acid and the remainder mainly palmitic acid), 10 parts by weight of azelic acid and 9 parts by weight of sodium hydroxide was dissolved in 400 parts by weight of water at approximately 180°F. This solution was slowly added, with stirring, to a solution of 24.9 parts by weight of aluminum sulfate octadecahydrate in

Continued on page 40



Use a base of a
METASAP® ALUMINUM STEARATE

Metasap Stearates are known the world over as *the cleanest stearates made.*

Also, the Metasap technical staff is notably successful in supplying makers of greases with the exact properties they need for each specific task. There's a Metasap base which gives you a high gel type grease when *that's* what you need; another for a medium heavy gel where smoothness is your chief requisite; still another produces with great economy the semi-fluid, adhesive-type lubricant known as castor machine oil.

Each of these...and many more...and modifications of each to meet your most exacting needs, are at your service, together with the counsel of the most experienced stearate men in America.

Won't you call on them for their recommendations, soon?

METASAP CHEMICAL COMPANY

METASAP CHEMICAL COMPANY
HARRISON, NEW JERSEY
Chicago, Ill. • Boston, Mass.
Cedartown, Ga. • Richmond, Calif.

A NOPCO Subsidiary

the cleanest stearates made

Continued from page 38

300 parts by weight of water at this same temperature. The resulting reaction mixture was filtered. The white precipitate which was formed during the reaction was washed with water by adding the white precipitate to a large amount of water and then stirring vigorously. The precipitate was washed in this manner three separate times until only a faint positive sulfate ion test was attained in the filtrate from the third wash. The resulting mixed soap was then dried at a temperature ranging from 210°F. to 250°F., was powdered and passed through a No. 60 mesh sieve.

Lubricating Greases from OXO Glycols

Greases having excellent lubricating properties over a wide temperature range particularly at extremely low temperature, are claimed to be produced, based on glycols which are the oxonation products of cyclic diolefins, particularly non-conjugated cyclic diolefins, such as butadiene dimers. According to U. S. Patent 2,768,139, issued to Esso Research and Engineering company, they are used as such or in the form of their esters with certain dibasic acids as lubricating oil bases.

Low temperature greases have been prepared by compounding low boiling mineral oil fractions having low viscosities with metal soaps in grease-making proportions. However, such greases are frequently subjected to relatively high temperatures in normal use. The mineral oil used in making the grease should, therefore, combine low viscosity with low volatility in order to provide efficient low temperature lubrication and at the same time prevent oil losses at relatively high temperatures. Since most low boiling mineral oils of sufficiently low viscosity have high volatilities, the number of mineral oils suitable for the production of low temperature greases is very limited.

More recently, it has been suggested to use certain synthetic oils, particularly certain esters of dibasic aliphatic acids as an oil constituent for low temperature greases. While greases containing these esters have highly desirable lubricating qualities as well as excellent high and low temperature characteristics, many of these esters are easily hydrolyzed. The soap and grease, therefore, must be made in separate stages. In addition, the available raw materials are rather limited. In view of the rapidly increasing demand for greases having utility over a wide range of temperatures, a broadening of the raw material basis is highly desirable.

It has now been found that certain glycols and some of their esters may be substituted for low boiling mineral oil fractions and synthetic oils of the type described above in the production of low temperature greases. In accordance with the patent, the glycols used have substituted alicyclic hydrocarbon radicals with at least two non-conjugated olefinic linkages, one of which is in a ring, and containing 5-30 and preferably 10-20 carbon atoms. These glycols have excellent lubricating qualities and combine relatively high boiling points with desirably low pour points, high flash points, low viscosity-temperature coefficients and high chemical stability.

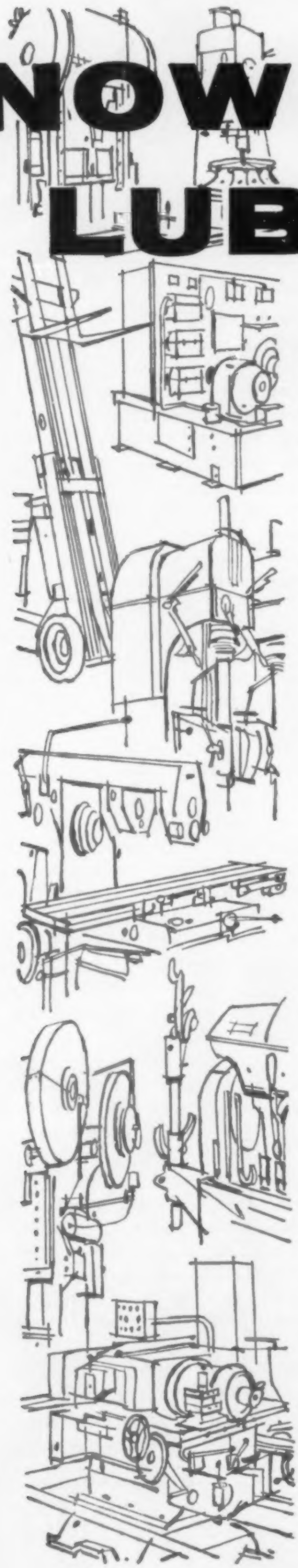
The preferred glycols of the patent may be obtained by subjecting cyclic diolefins, particularly non-conjugated cyclic diolefins to "oxonation" i. e., to a reaction with CO and H_2 in the presence of carbonylation catalysts, followed by hydrogenation of the product so obtained. In particular, cyclic compounds having one olefinic linkage in the ring and one olefinic linkage either in a side chain or in another ring, are adaptable to the process. Thus, it has been found, for example, that 1-vinyl cyclohexene-3 or 1-vinyl cyclohexane-4 reacts in the presence of a solvent, with carbon monoxide and hydrogen to give a product which, by hydrogenation, is converted into high yields of glycol containing 10 carbon atoms suitable as such or in the form of certain of its esters, as a lubricating oil constituent of the greases of the present invention. This reaction is accompanied to a certain extent by formation of nonyl alcohols, but is substantially unaccompanied by polymerization and resinification by-products hitherto reported as accompanying and as being the main product in the oxonation of diolefins. Similarly, dicyclopentadiene may be converted by the oxonation or "Oxo" process in good yields into a glycol suitable for the purposes of the present patent, with the simultaneous formation of C_{11}-alcohols.

This process involves the catalytic reaction of the diolefins dissolved in a hydrocarbon solvent, such as hexane or heptane, with carbon monoxide and hydrogen at elevated temperatures of about 225°-400°F. and pressures of about 2000-4000 p.s.i.g., particularly in the presence of cobalt catalysts, to form aldehydes having 2 carbonyl groups added to the diolefin originally used. The aldehyde is catalytically hydrogenated to the corresponding glycol. Minor proportions of lower boiling monohydric alcohols are formed as by-products. The total hydrogenation product is subjected to distillation to remove the monohydric alcohols and to recover the glycol as overhead product. The distillation residue, i. e., the so-called "Oxo-bottoms," is rich in by-product alcohols of higher molecular weight.

While the exact composition of all these glycols and alcohols is not known, it is well established that they are mixtures of primary alcohols. At least a substantial proportion of the monohydric alcohols is of the branched-chain type. The over-head glycol product consists of a mixture of glycols averaging 2 carbon atoms more than the olefin originally fed to the "Oxo" synthesis. It has been found that these glycols, particularly those containing at least 5, and preferably 10-20, carbon atoms have greatest utility for manufacturing greases.

For example, the oxonation product of butadien-1,4 dimer has the composition and properties listed below which give it excellent utility as a grease base.

Continued on page 42



Composition:	*Per Cent*
C	70.1
H	11.9
O	18.0
Properties:	
Boiling Range, °C.:	
At 3.1-3.3 mm. Hg.	153.5-156.9
At 760 mm. Hg.	305-317
Density, g./cc. at 25°C.	1.0
Refractive Index N_D^{20}	1.4890

As indicated above, certain esters may be derived from these Oxo-glycols which have likewise excellent lubricating oil characteristics which render the same suitable for the preparation of greases in accordance with the patent. These esters include the products obtained by esterifying C_5-C_{30} Oxo-glycols with 2 mols of a mono-basic fatty acid having 2-10 carbon atoms per molecule, such as acetic acid, propionic acid, the butyric acids, various C_5 acids, caproic acid, etc. Quite generally, it may be stated that acids suitable for the production of Oxo-glycol esters having desirable lubricating oil characteristics and particularly flash points of at least 350°F. are preferred.

Lubricating greases in accordance with the patent may be prepared by incorporating into these glycols or glycol esters grease-making proportions, say about 5-40 wt. per cent, of suitable metal soaps, preferably alkali metal soaps, such as sodium or lithium soap or alkaline earth metal soaps particularly calcium soaps of high molecular weight, preferably saturated fatty acids having 10-30 carbon atoms per molecule, such as stearic acid, hydrogenated fish oil acids, etc., or a soap-salt complex consisting of the soaps of higher molecular weight fatty acids and the salts of low molecular weight carboxylic acids, such as acetic, furioc, acrylic or similar acids. The metal soap or soap-salt complex is preferably added as such by slurrying the preformed dry soap or complex into the glycol base oil and heating the mixture to 300°-500°F. while stirring until a homogenous mass is obtained which is cooled to form the finished grease.

When Oxa-glycol esters are used, the grease thickening soap or soap-sal complex may be formed in situ. For this purpose, suitable fatty acids may be mixed with the glycol ester in grease-making proportions and heated to about 100°-200°F. A metal hydroxide, preferably caustic alkali, is then added in aqueous solution and in amounts at least sufficient to neutralize the acids. The mixture is heated to about 300°-400°F. until neutralization is completed and the mixture is completely dehydrated. Upon cooling, the grease is finished. For the production of low temperature greases, lithium soaps or lithium soap-salt complexes are preferred.

The greases may be further modified by the addition of other lubricating oils, particularly synthetic oils, such as the more readily hydrolyzable esters of dibasic acids, complex esters and others. Other con-

Trucking companies use lubricants containing Moly-Sulfide additives in as many as 12 points, because

Moly-Sulfide Extends Effective Lubrication

when hydrodynamic film is mechanically wiped away

One major trucking company now uses chassis grease containing Moly-Sulfide additive on all points of chassis lubrication. Bushings which formerly had to be replaced after 35,000 miles now last over 160,000 miles.

Another trucking company uses Moly-Sulfide additives in grease for fifth wheel lubrication. The squeezing and wiping action between the striker plate and the fifth wheel helps to orient the Moly-Sulfide film. After the grease is wiped off or squeezed out this film sustains lubrication until the fifth wheel is regreased. **Why?**

Because when Moly-Sulfide is added to lubricants it coats bearing surfaces with a protective film. If mechanical shock, water or shearing action displaces the hydrodynamic film, the Moly-Sulfide film sustains lubrication until the petroleum film is restored.

Greases with Moly-Sulfide additive are performing effectively by improving and extending lubrication in such vital parts as truck king pins, shackle bolts, spring eyes, fifth wheels, striker plates and torsion suspension bushings. In the railroad, aircraft, steel and oil drilling industries, Moly-Sulfide additive in greases is also performing in demanding applications.

Commercial quantities of experimental chassis grease are available from certain major oil companies. Climax Molybdenum Company is sponsoring fleet tests to study chassis greases containing Moly-Sulfide. Results will be made available at the conclusion of these tests.

You can use the coupon below to get bulletins, specifications, and sample of Moly-Sulfide.

Use the moly key ...to lubrication insurance

CLIMAX MOLYBDENUM

- Films on metal
- Low shear strength
- Resists:
  — heat
  — cold
- High film strength
- Non-Corrosive
  — water
  — chemicals

Department 58

CLIMAX MOLYBDENUM COMPANY

500 Fifth Avenue, New York 36, N. Y.

Please send me the following:

Literature
- ☐ "Moly-Sulfide, Lubricant Additive"
- ☐ "Moly-Sulfide in Chassis Grease"
- ☐ "Moly-Sulfide Specification and Properties"

Lists of Sources for
- ☐ Railroad Greases
- ☐ Chassis Greases

Sample — One-ounce tube of Moly-Sulfide ☐

Name________ Position________

Company________

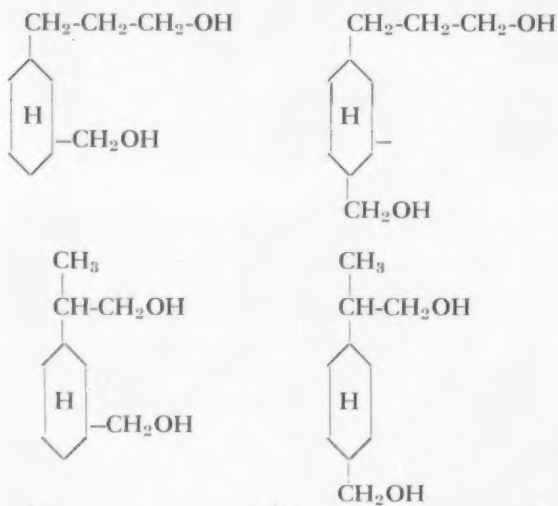
Address________

ventional modifying agents may be added to the greases of the patent in a manner known to the art. These include thickeners, such as N-stearyl-p-amino phenol, anti-oxidants, such as phenyl alpha-naphthylamine and phenothiazine, corrosion inhibitors, such as zinc naphthenate or petroleum sulfonate soaps, tackiness agents, such as polybutenes, poly acrylate and poly methacrylate esters, load-carrying compounds, such as sulfochlorinated hydrocarbons or lead oleate naphthenate, viscosity index improvers, such as polybutenes or poly acrylate esters, etc.

The preferred thickeners for low temperature greases in accordance with the patent are lithium soaps of hydrogenated fish oil acids or complexes of such soaps with lithium salts of low molecular weight carboxylic acids of the type described above. It may also be desirable to add small amounts, say, about 0.5-5 wt. per cent of a stabilizer to these greases to improve their texture and consistency. The oxides, carbonates, or soaps of metals forming amphotric oxides, such as the soaps of zinc, tin and aluminum, are useful for this purpose.

Example

A C_{10}-Oxo-glycol was produced by oxonation of butadiene-1,4 dimer as described above. The glycol product is believed to be a mixture of isomers having the standard formulae given below.



where

is the hexahydrobenzene ring. This glycol mixture was heated with a dry complex soap to 500°F. while stirring. The product set up to a smooth uniform soft grease upon cooling.

Ingredients:	*Wt. Per Cent*
Complex soap, Li-Hydrofolate* Li-acetate, Mole ratio 1:1	15
C_{10}-Oxo-glycol	85
Properties:	
Dropping point °F	420
Penetration, 77°F., mm./10:	
Unworked	280
Worked 60 strokes	300
Worked 60,000 strokes	360
Norma Hoffman oxidation, 4 lb. pressure drop with 1% phenyl alpha-naphthylamine added, hours	540
Hydrocarbon solubility	Insoluble
Water solubility	Not soluble in cold or hot water

This lubricant did not attack rubber.

Kettle-Cooled Lithium Stearate Grease Containing Alcohol

The earlier lithium base greases were not uniform in quality. This is emphasized by U. S. Patent No. 2,397,956 which states that prior to 1943 it had been proposed to manufacture lubricants containing lithium soaps of the fatty acids, as for example lithium stearate or lithium oleate. This patent also states that during the manufacture of such greases, difficulties have been experienced in obtaining successive batches of grease having the same uniform characteristics. For example, in the manufacture of grease containing lithium stearate, one batch of the grease may produce a relatively hard grease, and the succeeding batch may produce a much softer grease. These difficulties are eliminated when the grease is made with a lithium soap of a hydroxystearate acid, preferably a lithium soap of 12-hydroxystearic acid or a lithium soap of hydrogenated caster oil.

U. S. Patent No. 2,445,936 also was granted for a lithium stearate base grease. It is manifest, in view of the two foregoing patents, that lithium base greases, whether made with hydroxy stearate or lithium stearate as the soap base, have been pan-cooled. However, pan-cooling is one of the undesirable features of the present conventional and customary method of manufacturing lithium base greases because of the large area required for the cooling step and because it does not permit agitation of the grease while cooling. On the other hand, agitation of greases during cooling generally leads to better uniformity.

According to U. S. Patent 2,769,781, issued to Socony Mobil Oil company, the advantages of kettle-cooling, in contrast to pan-cooling, can be obtained in the manufacture of lithium base greases by adding a gel stabilizer to the grease.

It is an object of the patent to provide a grease having a lithium soap of a fatty acid other than hydroxy fatty acids as the primary gelation agent and containing a gel stabilizer.

The data presented in Table I are submitted to demonstrate that lithium stearate greases devoid of a

*Hydrofol acids are hydrogenated fish oil acids having a degree of saturation corresponding to stearic acid.

gel stabilizer when kettle-cooled are not satisfactory greases, whereas when a gel stabilizer is included in the formulation the kettle-cooled grease is satisfactory.

TABLE 1

Grease number	1	2	3	4
Components:				
Stearic acid per cent by weight	9.50	8.50	10.00	9.50
Lithium hydroxide mono-hydrate Per cent by weight	1.15	1.00	1.30	1.15
Lime flour Per cent by weight	0.45	0.45	0.30	0.45
Sodium stearate Per cent by weight	...	1.00	...	...
Sodium soap of hydrogenated Sperm oil Per cent by weight	...	...	...	1.00
Sodium soap of 12-hydroxy stearic acid Per cent by weight	...	...	1.00	...
Oxidation inhibitors Per cent by weight	0.20	0.20	0.20	0.20
800" SUV at 100° F. naphathenic mineral oil Per cent by weight	88.70	88.85	87.20	87.70
Appearance of grease	Grainy	Grainy	Smooth	Smooth
Penetration, A.S.T.M. (unworked/worked)	334/330	330/335	321/327	318/326
Shell rolling stability, 4 hrs. micropenetration	...	...	135/147	130/145
Water absorption (U. S. Specification O.S. 1350), per cent	100	100	80	40
Work stability (50,000 strokes, 1/16" holes)	425+	425+	392	423

Melting point, °F	118-126
Fatty acids, per cent	2
Saponification No. (mg. KOH/g.)	135-145
Iodine No.	6 (max.)
Unsaponifiables, per cent	35

Technical Committee

Chairman T. G. Roehner, Director of the Technical Service Department, Socony-Mobil Laboratories

In accordance with action taken during the 1956 annual meeting of the NLGI technical committee in Chicago, the SAE fuels and lubricants committee has been approached to explore the possibilities of that committee and the NLGI technical committee working jointly on problems involving chassis greases to the mutual benefit of both groups and car owners. The outcome was definitely encouraging. The SAE fuels and lubricants committee has requested their subcommittee C on chassis lubricants to meet with representatives of the NLGI technical committee. At this date, Mr. C. W. Georgi, chairman of the former subcommittee, is lining up SAE membership for this assignment and we are doing likewise for NLGI. It is planned to keep the membership of the joint committee small—at least in the early stages. One of the first subjects to be considered will be a review of the information published on chassis lubricants in the SAE Handbook.

To a considerable extent, the proposed joint activity with SAE is similar to that which led to the AFBMA-NLGI cooperative committee some years ago. Again, an effort will be made to have the NLGI member representatives of a cross-section of "know-how" within the technical committee in respect to grease performance possibilities from both laboratory and field application viewpoints. Suggestions or comments concerning this exploratory project with SAE should be sent to L. C. Brunstrum, E. W. Nelson or T. G. Roehner.

PEOPLE in the Industry

Lithium Corporation Staff Appointments

Salisbury Adams, general counsel and secretary of Lithium Corporation of America, Inc., joins the firm on a full time basis, according to an announcement by Herbert W. Rogers, president. Mr. Adams, previously associated with the law firm of Best, Flanagan, Lewis, Simonet and Bellows, graduated from the University of Minnesota (B.S. in metallurgy) in 1945 and from Harvard Law School (L.L.B.) in 1950. He is a member of the Hennepin County, Minnesota State and American Bar Associations and American Institute of Mining and Metallurgical Engineers.

Peterson Appointed Sales Representative

O. Martin Peterson has been appointed sales representative in the New York office of Lithium Corporation of America, Inc., it was announced by J. Douglas Campbell, vice president. Mr. Peterson was formerly associated with Borg Warner corporation in St. Louis. He will be covering the following territories: Ohio, Michigan, Indiana, Kentucky, and Tennessee.

Du Pont's Carpenter Directs Petro Chemicals

The appointment of W. Samuel Carpenter, 3rd, as director of sales of Du Pont's petroleum chemicals division succeeding David H. Conklin, who becomes managing director of the Du Pont Company (United Kingdom) Limited, has been announced. The appointments are effective April 1.

Carpenter, a chemical engineering graduate from Princeton University, joined the Du Pont company's engineering department in 1938. In 1944 he was assigned to construction operations at Hanford, Washington, where the government's atomic energy project was built and operated by Du Pont during World War II.

Returning to Wilmington in 1945, he entered the construction division of the engineering department. The following year he became manager of that department's planning division and later manager of its industrial engineering division. In 1947 he became assistant to the director of production of the rayon division of the former rayon department, and in 1949 became assistant manager of "Cordura" high tenacity rayon yarn sales. In August of 1950 he was made assistant manager of the rayon department's planning division. He was director of manufacturing for the cellulosics division before being named assistant director of sales for the petroleum chemicals division in 1955.

Conklin Is Director in United Kingdom

David H. Conklin, managing director of the Du Pont Company (United Kingdom) Limited, joined Du Pont in 1947 and shortly afterward became West Coast district manager for the petroleum chemi-

cals division, with headquarters in Los Angeles, Calif. Two years later, he was transferred to Wilmington, Del., as assistant sales manager of the division. In 1951, he was named assistant director of sales and on May 8, 1953, was made director of sales.

Prior to joining Du Pont, Mr. Conklin worked for Ingersoll-Rand, handling sales, service, and installation of industrial and oil field equipment at the company's Los Angeles office. He joined the U. S. Naval Reserve in 1939 and was called to active duty in April, 1941.

Other personnel changes in the petroleum chemicals division resulting from the promotions are:

Alfred R. Mullis, Eastern regional manager, will replace Carpenter as assistant director of sales.

Earl G. Bennett, now manager of the Central region, will become the new Eastern regional manager.

Donald W. Frison, manager of the Mid-Continent region, will move into the Central region post vacated by Bennett.

Charles D. Towery, manager of the Gulf Coast region, will take over the management of the Mid-Continent region in addition to his present position.

R. Carter W. Jones, sales promotion manager of the Petroleum Chemicals Division, has been named to the new position of sales service manager. He will be responsible for the operations, sales promotion, export sales, office, and general sales sections.

Harold C. Thompson, who is now assistant sales promotion manager, will succeed Jones as sales promotion manager.

H. A. Mayor, Jr. Featured

Last month's cover of *Midwest Industry* magazine featured H. A. Mayor, Jr. and followed up with a story about the executive vice president of Southwest Grease and the Wichita, Kansas operation. This member of the NLGI Board of Directors received a write-up in the magazine devoted to the advancement of industry in the Midwest.

American Lithium Institute Names Librarian

Mildred Hunt has joined the American Lithium Institute, Inc., Princeton, N. J., as research librarian, it has been announced by Marshall Sittig, president and managing director.

Miss Hunt will be responsible for organizing a central research library which will serve the indus-

try through the correlation and dissemination of information pertaining to applications and developments in the field of lithium and lithium compounds.

Prior to her association with the Institute, Miss Hunt served on the library staff of Food Machinery & Chemical Corp., and, before that, in the information center of the Sugar Research Foundation. In addition to her library work, she has done research on the synthesis of quaternary ammonium disinfectants at the Brooklyn Polytechnic Institute and on the synthesis of cyanine photosensitizing dyes at Peerless Photo Products.

Miss Hunt received her B.S. in education from Kent State University, Kent, Ohio, and her M.A. from Smith College, Northampton, Massachusetts. She is a member of the American Chemical Society, the American Institute of Chemists and the Special Libraries Association.

Petroleum Packaging Announces Officers

Nort Landon, of the Sun oil company, completed his one-year term as chairman in Baltimore, and H. A. Mayor, Jr., of the Southwest Grease & Oil company, was elected to replace him. (Mayor is also a member of the NLGI Board of Directors.) Other officers elected were Fred Beck of the Cities Service Oil company (Pennsylvania), as vice chairman, and Ken Lenhart, of Sinclair Oil company in New York, as secretary.

The Committee will next meet on June 4 and 5, 1957, at the Raddison Hotel in Minneapolis, Minnesota, as the guests of the Sta-Vis Oil company. The further progress of all sub-committees will be reviewed, also plant inspections of the Sta-Vis Oil company and the Archer-Daniels Chemical company have been planned. All packagers of petroleum are invited to attend.

Industry

Petroleum Packaging Committee Launches Seventh Year

At an early February meeting in Baltimore, Maryland, the Petroleum Packaging Committee, operating under the auspices of the Packaging Institute, concluded six years of valuable, important service to the petroleum industry.

With their successful standardization program mostly behind them, committee members at the meeting laid plans for further progress in all fields of sub-committee activity.

Special Attention to Industry Problems

Receiving the special attention of committee members were:

1. The development of a notebook to contain in simple, easily understood language complete information about small metal package making material and procedures.
2. A standardized shipping case measuring method.
3. Box car loading procedures and techniques.
4. Government-industry liaison and cooperation.
5. Asphalt and wax packaging information.
6. Possible design changes in the standard 55-gallon drum.

The activities of a sub-committee investigating new and unconventional package making material are also closely studied.

Visit to Plant and Packaging Facilities

The second day of the get-together featured a plant visit to the Balitmore oil and grease packaging factilities of the Esso company and to the Stalfort Pressure Pak Co., where members studied with interest new developments in aerosol packaging.

Shell Reports One Year Motor Oil Survey

A Shell Oil company engineer recently stated that more than half of 16,000 cars checked throughout the country needed oil changes.

Val A. Gates, senior engineer in Shell's products application department, made the statement in a paper prepared for the Lubrication Committee meeting of the American Petroleum Institute. The group met in the Sheraton-Cadillac Hotel in Detroit.

Gates said the one-year survey was made to find out how the motoring public is using different grades of motor oils now on the market. Crankcase oil samples were taken both from cars having oil changes and cars driven into Shell stations for gasoline. The oil samples were tested through the use of the Shell ADC oilprint analysis.

Gates said 22 per cent of the motorists changed oil at 1,100 miles, but that the average change interval was at 1,843 miles. He said the survey also showed that approximately 72 per cent of the motorists changed their oil by 2,000 miles.

He said one of the highlights of the survey is that "oil is actually being changed less often than the public thinks."

According to Shell, the ADC oilprint analysis is a technical test conducted by trained personnel. It is used with large automotive fleets. The test is not available in service stations.

Du Pont Tetraethyl Lead Compound Cost Increase

An increase of less than one cent per pound in Du Pont tetraethyl lead antiknock compound, to compensate for increases in raw material, transportation, and other costs, was announced.

With April 1 shipments the domestic price of Du Pont Motor Mix

compound will be 37.92 cents per pound compared to the former price of 37 cents per pound. Motor Mix A is raised to 37.48 cents per pound from 36.58 cents. The price of Aviation Mix has been upped from 40.58 cents per pound to 41.5 cents.

In terms of TEL content, the new price is approximately 61.68 cents for Motor Mix compound, 62.68 cents for Motor Mix A, and 67.58 cents per pound for Aviation Mix compound.

AP&CC Constructs Special Production Plant

American Potash & Chemical Corporation has announced plans to construct a $5,000,000 chemical manufacturing plant at Aberdeen, Miss., for the production of sodium chlorate.

Construction will start immediately at a 586-acre site on the Tombigbee River seven miles outside of Aberdeen, with completion scheduled for mid-1958. Initial production at the Aberdeen plant will be at the rate of 15,000 tons of sodium chlorate per year, with provisions for possible future expansion into other chemical fields.

The new facility marks AP&CC's first venture east of the Mississippi River for the manufacture of its Trona electrochemicals. When the plant is in production, it is believed AP&CC will be the largest producer of sodium chlorate in the western hemisphere.

Aberdeen was chosen as a site because of low-cost electric power available from Tennessee Valley Authority and because of Aberdeen's strategic location in the heart of the expanding southern pulp and paper industry. Sodium chlorate is used in the chlorine dioxide bleaching process for kraft pulp and paper and in the manufacture of weed killers and cotton defoliants.

American Potash & Chemical Corporation currently manufactures sodium chlorate at its Henderson, Nev., plant as well as potassium chlorate, ammonium and potassium perchlorate and manganese dioxide.

In addition to chlorates and perchlorates, AP&CC is a major producer of industrial and agricultural chemicals including borax, lithium, salt cake, soda ash and potash. Other AP&CC facilities are located at Los Angeles, Whittier and Trona, Calif.; Henderson, Nev., and San Antonio, Tex., site of the AP&CC subsidiary, American Lithium Chemicals, Inc.

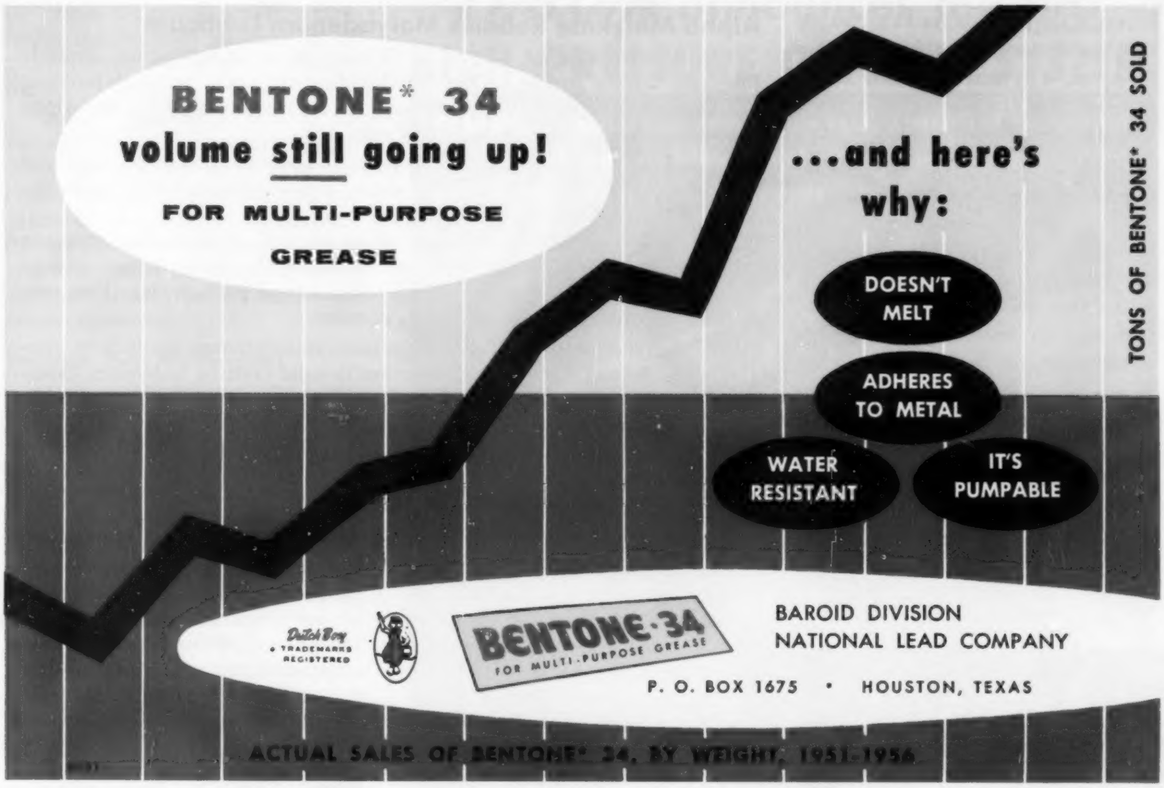
Emery Expands Canadian Market

Emery Industries, Inc., Cincinati, announces another major step in its expansion program with the formation of a wholly-owned subsidary, Emery Industries (Canada) Ltd.

The new Canadian company will acquire the land, buildings, manufacturing facilities and existing fatty acid business of S. F. Lawrason & Co., Ltd., of London, Ontario, on April 1. Lawrason has been a well-known producer of fatty acids in Canada for over 75 years.

R. T. Hull, associated with Emery for many years in sales, product management and sales management, has been appointed vice president and general manager of Emery Industries (Canada) Ltd.

A sizeable investment is planned for expansion and modernization of present facilities. Installation of new equipment will enable Emery's Canadian branch to produce a complete line of top-quality fatty acids for the Canadian market equivalent to those currently supplied in the U.S.



"Properties of Petroleum Reservoir Fluids" Now Available

"Properties of Petroleum Reservoir Fluids," published in February by John Wiley & Sons, formulates the principles that remain constant in this changing field, and considers the practical aspects as well. The author is Emil J. Burcik, associate professor of petroleum and natural gas engineering at the Pennsylvania State University.

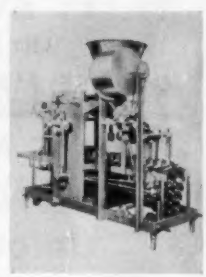
Developed in a logical sequence, the subject matter begins with an account of the hydrocarbons which constitute petroleum. Next related is the behavior of hydrocarbons in in the gaseous state, not only for simple ideal systems but also non ideal systems such as those often observed at high pressures and temperatures in petroleum reservoirs. Dr. Burcik then deals with liquid systems, following this with a discussion of the properties of systems which contain both liquid and vapor. These latter systems are described from a qualitative and quantitative standpoint, with ideal and non ideal systems again considered here.

The following chapter covers the properties of crude oils and gives the empirical correlations that must be employed in dealing with systems of this type. In the final chapter, the author works out several practical applications of the concepts developed in the text.

Many example calculations are presented throughout in order to illustrate the principles as they are developed. In addition, Dr. Burcik incorporates all data, tables, and correlation charts necessary to solve a wide variety of commonly encountered problems.

"Properties of Petroleum Reservoir Fluids" contains 190 pages and is priced at $7.50.

Hope Introduces Filling Machine



Hope Machine company, of 9400 State road, Philadelphia, Pa. is introducing what that company describes as the first high speed, heavy duty filling machine ever produced to pack fiber cartridges with grease, caulking, roofing cement, buffing compound and similar viscous materials. The new machine, known as Type 27 cartridge filler, meets a real need for higher filling speeds with less labor. It is extremely accurate and does not depend upon the judgment of the operator to establish the fill level. Only one op-

erator is required to feed cartridges into the dispensing stacks at the in-feed end. The same operator keeps the unscrambler barrel filled with lids and checks the machine's performance.

Cartridges Filled From Bottom Up

Cartridges are automatically removed from the dispensing stack and conveyed to the filling station, where they are filled from the "bottom up" to insure a uniform fill without any air pockets.

An unscrambler barrel (next to hopper in photograph) is provided to supply lids to the feed chutes mounted above each filling line. Then, in the next operation the press station of the machine pushes each lid firmly and securely into the cartridge to the depth required.

Alpha Molykote Readies Molybdenum Lubricant

The development of Molykote, Type GX, a molybdenum disulfide lubricant with a strong affinity for bonding to metal without building excessive accumulation on the surface, has been announced by the Alpha Molykote Corporation, Stamford, Conn.

Type GX is a refinement of Molykote, Type G, the most successful molybdenum disulfide lubricant in use in every industrial country in the world.

In Type GX the maximum effectiveness of MoS_2 as an extreme pressure lubricant in a grease is achieved by increasing the total surface area of the molybdenum disulfide through a reduction of particle size. This permits a sharp reduction of the MoS_2 content.

The decrease in particle size brings more molybdenum disulfide in contact with the metal while the reduction in solid content minimizes excessive surface accumulation.

Additional information may be obtained from the Alpha Molykote Corporation, 65 Harvard Avenue, Stamford, Connecticut.

Service Station Installs All Balcrank Lube Units for Large Operation

One of the world's largest and most modern service stations has opened outside Fremont, Ohio, on US 20, with a lubrication department which may point the trend for future "super" operations. The new Fremont Oil company is equipped with Balcrank lube units.

To keep the wheels of the trucking and motoring industry rolling fast and efficiently the Four-Mile Fleet-Wing service center has adopted the latest technological methods and mechanical equipment for servicing and lubricating vehicles.

A staff of specially trained lubrication technicians are on hand around the clock to keep trucks and autos in top flight condition. This staff is trained to change the oil and lubricate every model of highway truck and trailer.

To accomplish this tremendously important job effectively, the service center has three heavy duty Balcrank lubrication units which are designed to give rapid and thorough service. These units are equipped with two large air compressors to assure maximum pressure to all parts and areas requiring lubrication.

Two standard trucks and trailers can be greased at one time in this huge service center.

Beacuse of the four, two-story high garage doors at both ends of the lubrication department, it is possible to drive the entire, fully loaded truck and trailer right into the garage. When a grease job is completed the unit can be driven

out one of the rear doors. This eliminates the biggest headache of all truckers—the necessity of backing up.

"Inside" greasing is also an advantage during inclement weather when the rain and snow further increase the problem of thawing out grease or lube fittings. This area of the mammoth service center is warm and well heated for the convenience and comfort of truckers and service center personnel.

Thorough Truck Maintenance

Truck maintenance at the Fleet-Wing service center is extremely thorough. A truck really gets a "going over" at this station. For example, besides lubricating and changing the oil, the oil filter is changed, motor flushed, oil and grease changed in the differential and transmission, spark plugs cleaned and checked, battery water is checked and serviced, radiator checked for burnt out or damaged bulbs, etc. This entire operation is standard procedure on every truck and trailer.

These is also a passenger car lubrication department, e q u i p p e d with a hydraulic greasing lift plus another Ballcrank lubrication unit. Automobiles go through the same "preventative" maintainance operation as the large highway trucks. This is also a thorough and rapid program designed for regular and tourist customers for safe highway traveling.

Obligation to Motorists Stressed by Lubrication Committee

The automotive and petroleum industries discussed their common problems with an eye toward closer cooperation which will benefit their mutual customer—the American motorist.

Six experts—three from each industry—presented papers on current lubrication problems before some 350 oil and automotive men attending the 8th annual Detroit meeting of the Lubrication Committee of the American Petroleum Institute

marketing division.

The need for even closer cooperation was stressed if further progress is to be made in providing the motoring public with vehicles requiring a minimum of lubrication upkeep.

R. B. Teiper, director of service, Chrysler division, Chrysler Corporation summarized the problem of chassis lubrication by pointing out that: Future vehicles will continue to require such lubrication, but designs will be altered so that a minimum of points will require hoist operation; Strict attention to proper procedure and proper frequency of lubrication is the greatest service that can be performed for the customer; There is a need for more effective, longer lasting chassis lubricants. As an example of the strides being made in reducing the number of grease fittings, Teiper cited a 1956 model with twenty-three fittings whose 1957 counterpart has only eight.

J. B. Stucker, director of product development for the Pure Oil company said that as the result of the two industries working in conjunction with the Army Ordnance Department in relating laboratory experiments to field test performance, it appears that "we now have gear lubricants that are really multipurpose in every respect." In an interesting sidelight, he commented that the lower silhouette of the new cars generally results in less cooling of the gears, which places an even greater demand on differential gear lubricants.

Doman Stresses Need for Mechanics

C. T. Doman, a Ford Motor company executive estimated that by 1965 some 150,000 more mechanics will be needed to service and repair this nation's motor vehicles. This number will be necessary Doman explained, unless the automotive and oil industries, working together, improve the productivity of mechanics or decrease the maintenance required through improvement in design and lubrication. Doman also emphasized that the automobile service business is, in the final analysis "a people business." He cited the progress that has been made in increased engine life, and described company records showing piston ring life in 1925 average 10,000 miles compared to more than 75,000 miles in 1955. He said that some of the problems confronting the two industries in furnishing and servicing the American motoring public indicate the need for more research on the part of both into the mechanism of wear and tear, particularly as it relates to surface structure of metals and the metallurgy of the lubricate load transmitting parts.

V. A. Gates, senior engineer, products application department, Shell Oil company, presented a paper in which he pointed out that

the average motorist changes crankcase oil at 1,843 miles. This average figure, he added, is below a 2,000 mile limit recommended on the basis of a survey conducted by his company.

Other papers were presented by E. J. Krause, general service manager for Buick and J. G. Moxey, Jr. assistant director of research and development for Sun Oil company.

Boner and Procurement Committee Seek Technical Articles

The NLGI SPOKESMAN is now in a position to devote its space to more technical articles concerning lubricating greases . . . this statement was made recently by C. J. Boner (Battenfeld Grease and Oil), chairman of the technical subcommittee for procurement of technical papers for the publication. Pointing out that the increased size of the Institute's journal now makes it possible to include material other than just those papers presented at NLGI annual meetings, Boner stressed that a growing number of authors are offering their work to NLGI. This is true of college and university researchers, he noted, as well as government technicians.

The quality of the reports submitted to date has been uniformly high, Boner said. All material presented for publication is subject to the same screening procedures via committee that annual meeting papers receive. The purpose in soliciting articles is a dual one, he added . . . to provide a means to publish more about lubricating greases and for the Institute to offer more in the way of member (and public) service.

Committee members serving with Boner include J. L. Dreher (California Research), S. L. Cosgrove (Battelle Institute) and F. W. Luckenbach (Foote Mineral). Material may be given to any of these committee members or sent to the NLGI national office for forwarding.

Socony Acquires Plant Site For Petroleum Technology

The Socony Mobil Oil Company, Inc., has completed purchase of a 315-acre site near Princeton, N. J., for construction of a nuclear research center. Its basic use, the company announced will be for the study of the application of radiation to petroleum technology.

Transfer of title to the property, known as Stony Brook farm, in Hopewell township, took place in Trenton, N. J. In selecting the site, the company said, Socony Mobil was influenced by the prominence of the Princeton area as an educational center and by the recent concentration of scientific research institutions.

Will Be Subdivision of Paulsboro

The new center will be operated as a subdivision of the Socony Mobil Research and Development Laboratory at Paulsboro, N. J. It will contain:

1. A 2,000,000-electron-volt Van de Graaff accelerator. With associated facilities it will provide high-energy electrons, protons, X-rays, and neutrons for basic research.
2. A "hot" laboratory equipped for manipulation of fission-waste radioisotopes as well as secondary radioactive sources, such as Cobalt-60.
3. "Counting" laboratories for assaying radioactive materials.
4. Safety facilities for the health protection of staff members.

The company expects to make use of the large Georgian residence near the center of Stony Brook farm as an administration building and library.

Continued on page 62

NLGI Spokesman Index Volumes XV Through XX Now Available

The first index of the NLGI SPOKESMAN to be offered in five years has been completed and is now being offered as a complimentary service to subscribers of the journal of the National Lubricating Grease Institute.

Begins with April 1952

Beginning with technical features presented in April, 1952, the SPOKESMAN index covers material presented from Volume XV through the latest set, Volume XX . . . completed in March, 1957. Three separate breakdowns are given . . . listings are by authors, titles and classifications. Annual supplements will be supplied in the future, as each volume is completed.

Mailings of the index to NLGI members have just been completed. Those subscribers desiring one or more indexes may obtain them by writing the national office . . . 4638 J. C. Nichols Parkway, Kansas City 12, Mo.

American Lithium Institute Launches Research Program

The American Lithium Institute has initiated a program of sponsored research on lithium alloys at Massachusetts Institute of Technology and on lithium-containing glass at Pennsylvania State university. The Institute will also establish fellowships at the two institutions.

The announcement of the research projects and fellowships was made by Marshall Sittig, president and managing director of the newly formed Institute, at a press conference in New York City.

Principal Project of Institute

Sponsoring such projects as these two studies is one of the two principal functions for which the American Lithium Institute was formed last November. The other is collection and dissemination of technical information on lithium and its compounds. Since a technical library is already being set up at the Institute offices in Princeton, N. J., and several publications are under preparation, the MIT and Penn State projects put the new organization into full-scale operation, Mr. Sittig stated.

Member companies of the American Lithium Institute, Inc. are the three major U. S. lithium producers—American Potash and Chemical corporation, Foote Mineral company and Lithium Corporation of America.

Reprints of Technical Articles Now Are Standard Feature

A record number of reprints have been prepared for members and friends of NLGI during the first quarter of 1957 . . . these have been taken from technical and marketing features presented in the January, February and March issues of the NLGI SPOKESMAN and were presented in booklet form. More than 25,000 reprints have been ordered from the Institute in this fashion since the first of the year.

Page Forms Retained for 90 Days

Because page forms of all material published in the journal are kept standing for three months following the issue date, articles of lasting interest can be reprinted at printer's cost plus postage . . . for a very small investment per copy. Most of the articles are distributed for promotional or instructional purposes and carry a company imprint and/or advertising.

This form of distribution can be most economical when compared to pre-print or post-print orders of the complete magazine. Orders should be addressed to the national office within 90 days after receipt of the issue containing the feature to be reproduced.